# HARLEY-DAVIDSON ELECTRA GLIDE & SUPER GLIDE

FL, FLH, FX & FXE models
74cu in (1200cc) □ 1974 on

Haynes

# Owners Workshop Manual

629.2275 HAR FL

13. MAR. 1981

MONTHLY LOAN

166 19/2

166 26

28 SEP 1984

MONTHLY LOAN

461

WITHDRAWN FROM LANCASHIRE LIBRARIES

AUTHOR
DARLINGTON, M

CLASS
629·2275

TITLE Harley-Davidson electra glide and super glide owners W. S. M.

No.
46023968 6

LANCASHIRE COUNTY COUNCIL

This book should be returned on or before the latest date shown above to the library from which it was borrowed

LIBRARY HEADQUARTERS, 143 CORPORATION STREET, PRESTON, PR1 8RH

Lancashire County Library

30118082127303

# Harley-Davidson Electra Glide and Super Glide Owners Workshop Manual

by Mansur Darlington

**Models covered:**

| | | | |
|---|---|---|---|
| FX | Super Glide | 73.66 cu in (1207 cc) | 1973-77 |
| FXE | Super Glide | 73.66 cu in (1207 cc) | 1973-77 |
| FL | Electra Glide | 73.66 cu in (1207 cc) | 1973-77 |
| FLH | Electra Glide | 73.66 cu in (1207 cc) | 1973-77 |

ISBN 0 85696 330 5

© Haynes Publishing Group 1977

1744/330

All rights reserved. No part of this book may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording or by any information storage or retrieval system, without permission in writing from the copyright holder.

Printed in England

HAYNES PUBLISHING GROUP
SPARKFORD YEOVIL SOMERSET ENGLAND
*distributed in the USA by*
HAYNES PUBLICATIONS INC
861 LAWRENCE DRIVE
NEWBURY PARK
CALIFORNIA, 91320
USA

# Acknowledgements

Our grateful thanks are due to Ken Lee, Honorary Secretary of the Harley-Davidson Riders Club of Great Britain, who kindly loaned us the Electra Glide model on which the photographic sequences in this manual are based. The spares which were required in the rebuild were supplied by Fred Warr, of Kings Road, London, SW6.

Brian Horsfall gave the necessary assistance with the overhaul and devised the ingenious methods used to overcome the lack of service tools. Les Brazier arranged and took the photographs that accompany the text. Jeff Clew edited the text.

We would also like to acknowledge the help of the Avon Rubber Company, who kindly supplied the illustrations about tyre fitting, NGK Sparkplugs UK Ltd, for providing the illustrations about plug electrode conditions and Renold Limited, for information about equivalent British - made chains.

46023968 6

# About this manual

The author of this manual has the conviction that the only way in which a meaningful and easy to follow text can be written is first to do the work himself, under conditions similar to those found in the average household. As a result, the hands seen in the photographs are those of the author. Even the machines are not new: examples that have covered a considerable mileage were selected so that the conditions encountered would be typical of those found by the average owner. Unless specially mentioned, and therefore considered essential, Harley-Davidson service tools have not been used. There is invariably some alternative means of loosening or removing a vital component when service tools are not available but risk of damage should always be avoided.

Each of the eight Chapters, is divided into numbered Sections. Within these Sections are numbered paragraphs. Cross reference throughout the manual is quite straightforward and logical.

When reference is made 'See Section 6.10' it means Section 6, paragraph 10 in the same Chapter. If another Chapter were meant, the reference would read 'See Chapter 2, Section 6.10'. All the photographs are captioned with a Section/paragraph number to which they refer, and are relevant to the Chapter text adjacent.

Figures (usually line illustrations) appear in a logical but numerical order, within a given Chapter. Fig. 1.1 therefore refers to the first figure in Chapter 1.

Left-hand and right-hand descriptions of the machines and their components refer to the left and right of a given machine when the rider is seated normally.

Whilst every care is taken to ensure that the information in this manual is correct no liability can be accepted by the authors or publishers for loss, damage or injury caused by any errors in or omissions from the information given.

# Modifications to the Electra Glide and Super Glide range

The Electra Glide and Super Glide, although machines of different concept and function, utilise the same engine, gearbox and frame assemblies. In addition, a large number of ancillary components and cycle parts are shared. Since 1972 few important modifications have been incorporated, and except for the change in 1976 to the electrical system and type of carburettor used, none fundamentally alter the procedure for maintenance or overhaul. Although this manual specifically covers all models from 1973, when disc brakes, both at the front wheel and the rear had been adopted, it will be of some assistance to owners of 1200 cc Harley-Davidsons from 1961 onwards, which are similar in many respects.

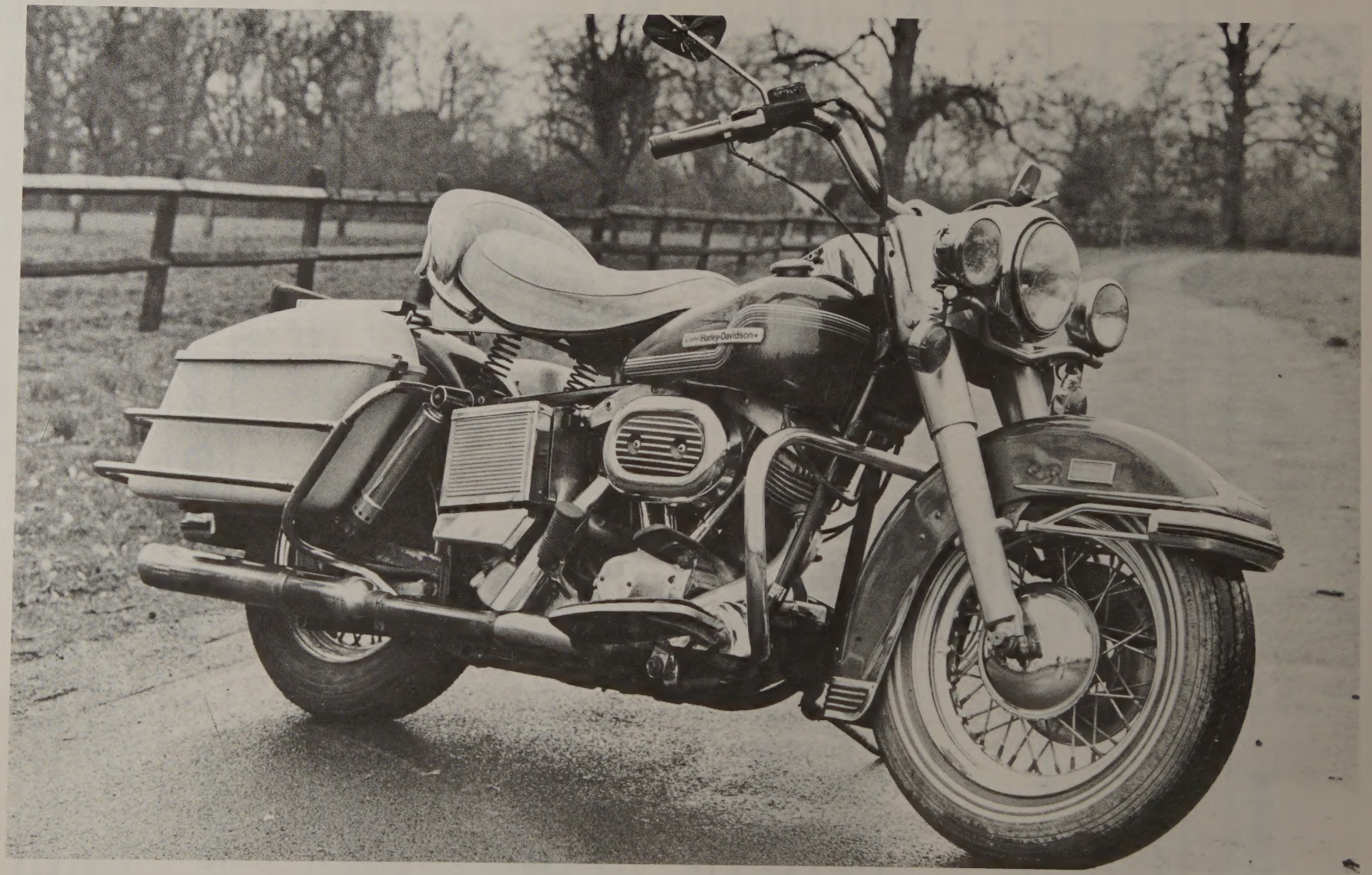
It will also prove of help to those who construct and/or own specials of the 'chopper' type, based on the 120 cc Harley Davidson engine.

# Contents

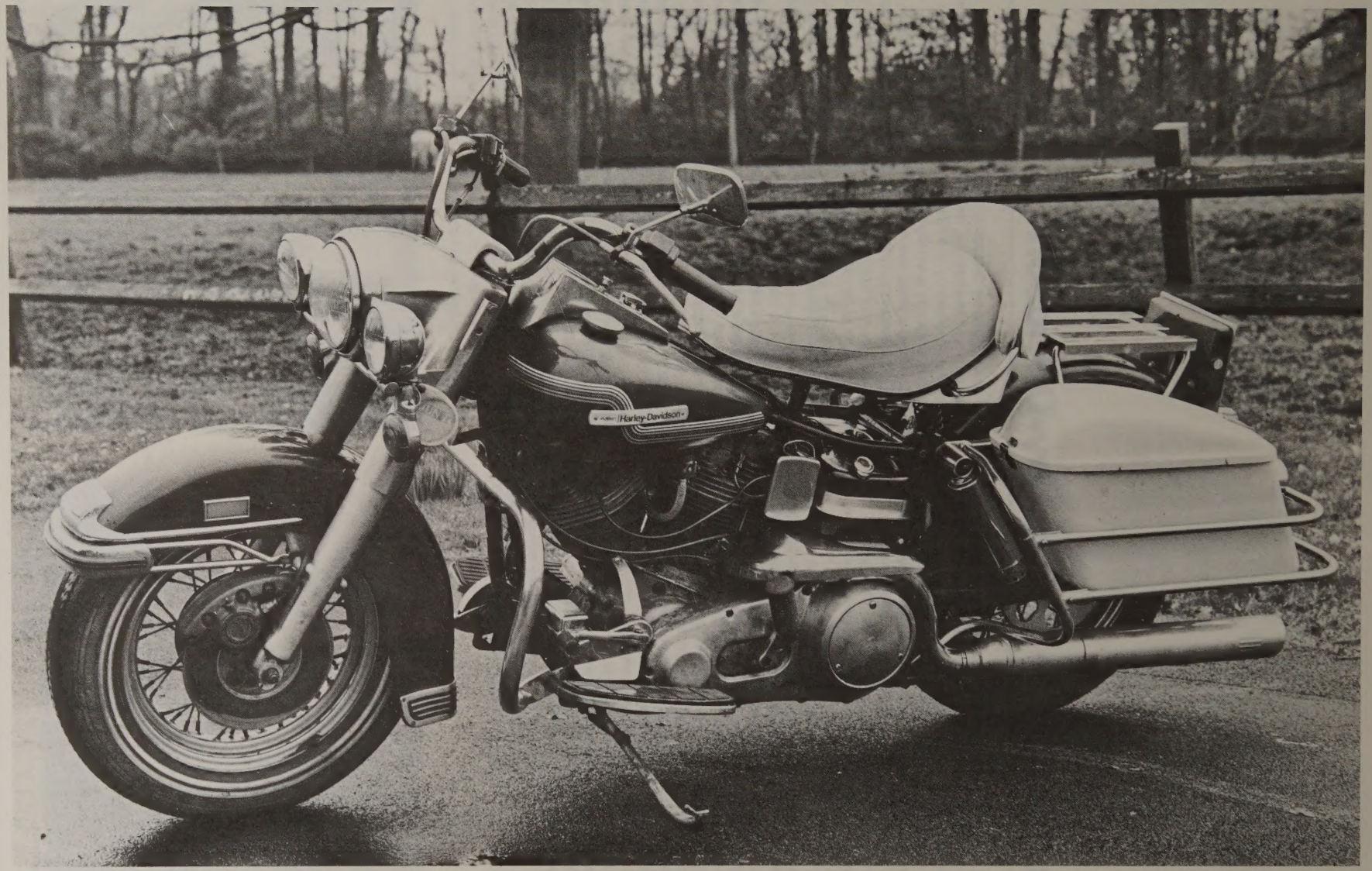

| Chapter | Section | Page | Section | Page |
|---|---|---|---|---|
| **Introductory sections** | Acknowledgements | 2 | Modifications to the Electra Glide | |
| | About this manual | 2 | and Super Glide range | 2 |
| | Capacities | 15 | Ordering spare parts | 7 |
| | Dimensions | 6 | Quick glance maintenance adjustments | 15 |
| | Introduction to Harley-Davidson | 6 | Recommended lubricants | 15 |
| | Working conditions and tools | 15 | Routine maintenance | 8 - 14 |
| **Chapter 1: Engine** | Automatic advance unit | 47 | Small end bearing and gudgeon pin | 37 |
| | Big-end and main bearings | 36 | Oil pump | 33, 44 |
| | Crankcase castings | 42 | Oil seals | 42 |
| | Cylinder barrels | 38 | Pistons and rings | 38 |
| | Cylinder heads | 38 | Rocker boxes | 39, 49 |
| | Dismantling: general | 25, 28 | Reassembling: general | 42 |
| | Examination and renovation: general | 35 | Timing pinions | 41 |
| | Hydraulic tappets | 41 | Valves | 38 |
| **Chapter 2: Gearbox** | Bearings: examination | 65 | Reassembly | 68 |
| | Dismantling | 58 | Removal from frame | 58 |
| | Gear clusters: removal | 58 | Selector box and drum | 59 |
| | Kickstart | 67 | Selector forks and mechanism | 68 |
| **Chapter 3: Clutch and primary drive** | Adjustment: clutch | 77 | Primary chain and engine | |
| | Dismantling | 74 | sprocket | 78 |
| | Examination and renovation | 78 | Reassembling clutch | 77 |
| **Chapter 4: Fuel system and lubrication** | Air cleaner | 86 | Oil filter | 90 |
| | Carburettors | 83 - 85 | Oil pressure switch | 90 |
| | Exhaust system | 87 | Petrol tank | 80 |
| | Engine lubrication | 87 | Petrol tap removal | 81 |
| **Chapter 5: Ignition system** | Automatic advance unit | 96 | Contact breaker | 94, 95 |
| | Condenser | 95 | Spark plugs | 96 |
| | Coil | 94 | Timing: ignition | 95 |
| **Chapter 6: Frame and forks** | Cleaning the machine | 114 | Rear brake pedal | 112 |
| | Drive cables: speedometer and | | Rear suspension units | 112 |
| | tachometer | 114 | Speedometer and tachometer | |
| | Dual seat | 112 | heads | 113 |
| | Frame assembly | 108 | Steering head bearings | 108 |
| | Front forks | 99 - 101 - 103 - 106 | Swinging arm rear fork | 108 |
| | Footboards and footrests | 112 | Sidecar alignment | 114 |
| | Prop stand | 112 | | |
| **Chapter 7: Wheels, brakes and tyres** | Bearings: front wheel | 118 | Final drive chain | 126 |
| | rear wheel | 121 | Master cylinders | 122 |
| | Bleeding the brake system | 123 | Sprocket: rear wheel | 123 |
| | Brakes: disc front | 171 | Tyres | 128 |
| | rear | 121 | Wheels: front | 116 |
| | Chain oiler | 126 | rear | 121 |
| | Chain oiler adjustment | 126 | Wheel balancing | 128 |
| **Chapter 8: Electrical system** | Alternator | 130 | Starter motor | 131 |
| | Battery | 131 | Starter motor solenoid | 133 |
| | Bulbs: replacement | 134 - 136 | Switches: handlebar | 138 |
| | Flashing indicator relay | 136 | ignition and lighting | 138 |
| | Headlamp | 134 | stoplamp | 139 |
| | Horn adjustment | 136 | Wiring diagrams | 141 - 149 |
| | Rectifier-regulator module | 131 | | |

**Note:** General descriptions and specifications are given in each Chapter immediately after list of contents.
Fault diagnosis is given at the end of appropriate Chapter.

**Index** 150 - 151




1975 Harley-Davidson FLH 1200 Electra Glide Model




1975 Harley-Davidson FLH 1200 Electra Glide Model

# Introduction to the Harley-Davidson

William S. Harley and Arthur Davidson jointly designed and built their first motorcycle during 1903, constructed along the lines of a powered bicycle. The single cylinder, air-cooled engine had a bore and stroke of 2 1/8 x 2 7/8 inches and is alleged to have been one of several built for experimental purposes. The weaknesses of the powered bicycle approach soon became apparent and a larger capacity engine followed, having much heavier flywheels. Fitted with the new, more powerful engine, the bicycle was able to climb hills more easily, but in turn weaknesses in the frame design became apparent. And so the design progressed until something quite usable and marketable was available. Land was purchased in Milwaukee for the erection of a simple, two storey factory, and the Harley-Davidson joined the ranks of the world's motorcycles. By the end of 1906, fifty machines had been assembled at Chestnut Street and the order book was full, portending well for the year to follow.

1909 proved to be a milestone in the history of the company, for it was during that year that the company launched their first vee twin. It was this model, and others that followed, that helped create the legend of the large capacity vee twin, a field in which Harley-Davidson ruled supreme for so many years. In private hands it gave a standard of comfort, performance and reliability second to none, whilst on the racetrack it became a snarling, powerful beast, with the ability to perform incredible feats of speed and endurance that made the headlines.

Contrary to expectations, the American motorcycle boom did not last long and by the 1930s it had all but petered out. It was largely the more sporting side that kept things going, although another small but useful offtake was by the police, for law enforcement purposes. The American 'speed cop' was very much a part of life and a big, powerful vee twin gave him a certain amount of flexibility that would not have been possible in a patrol car.

The modern Harley-Davidson Electra Glide was never introduced as a model, as such, but is a development of such machines as the model 74K which was introduced in 1941, and more directly the Duo Glide of the late '50s. This can be seen readily, when it is noted that many parts fitted to the latest model are not only similar, but in many cases identical to components fitted to the war-time machines. The policies of the company, reflecting the motorcycling needs of the home market, have produced a machine ideally suited to the task of travelling vast distances in comfort, and which has evolved a personality and charisma which has made Harley-Davidson a household name. The Super Glide model was introduced in 1971 to cater for the rider requiring a sportier and lighter machine, yet not lacking in the glamour of its more heavily dressed stablemate.

# Dimensions

| | FL and FLH | FX and FXE |
|---|---|---|
| **Saddle height** | 33 in (838.2 mm) | 29 in (736.6 mm) |
| **Overall length** | 93.5 in (2374.9 mm) | 92 in (2336.8 mm) |
| **Wheelbase** | 61.5 in (1562.1 mm) | 62.75 in (1593.9 mm) |
| **Ground clearance** | 6.0 in (152.4 mm) | 5.12 in (130.0 mm) |

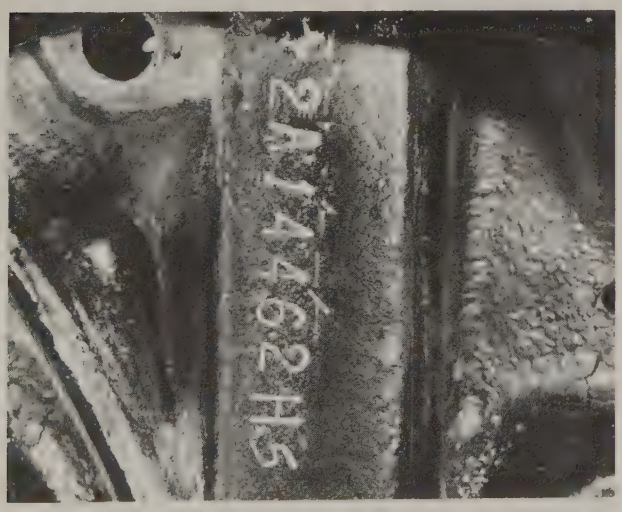
# Ordering spare parts

When ordering spare parts for any Harley-Davidson, it is advisable to deal direct with an official Harley-Davidson dealer or repair specialist, who should be able to supply the parts required from stock. Parts cannot be ordered direct from the Harley-Davidson Motor Co., Inc; they must be routed via an approved agent, even if the parts required are not in stock.

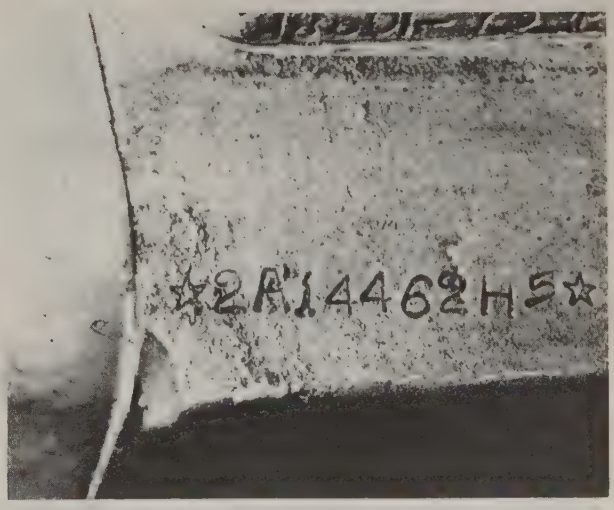
Always quote the engine and frame numbers in full. Include any letters before or after the number itself. The frame number is stamped on the right-hand side of the massive casting that forms the steering head assembly. The engine number is stamped on the right-hand side of the crankcase assembly, immediately above the timing chest. If painted or coloured parts are required a note should be included about the colour of that part involved, so that a correct match will be obtained.

Use only parts of genuine Harley-Davidson manufacture. Pattern parts are sometimes available, at what may at first seem to be advantageous prices. Experience has shown that in many instances these latter replacement parts are of inferior quality, leading to unexpected breakdowns and the need for renewal at more frequent intervals. What may seem cheap initially will often prove much more expensive in the long run. Some of the more expendable items, such as clutch plates and brake shoes etc, may be available on a service-exchange basis. This is worth while enquiring about. Provided the part handed in is suitable for reconditioning, a considerable saving can be effected by taking advantage of schemes of this nature.

More common parts, such as spark plugs, bulbs, tyres, oils and greases etc., can be obtained from accessory shops and motor factors, who have convenient opening hours, charge lower prices and can often be found close to the home. It is also possible to obtain parts on a mail order basis from a number of specialists who advertise regularly in the motorcycle press.




Frame number location




Engine number location

# Routine maintenance

Periodic routine maintenance is a continuous process that commences immediately the machine is used. It must be carried out at specified mileage recordings, or on a calendar basis if the machine is not used frequently, whichever is the sooner. Maintenance should be regarded as an insurance policy, to help keep the machine in the peak of condition and to ensure long, trouble-free service. It has the additional benefit of giving early warning of any faults that may develop and will act as a regular safety check, to the obvious advantage of both rider and machine alike.

The various maintenance tasks are described under their respective mileage and calendar headings. Accompanying diagrams are provided, where necessary. It should be remembered that the interval between the various maintenance tasks serves only as a guide. As the machine gets older or is used under particularly adverse conditions, it would be advisable to reduce the period between each check.

For ease of reference each service operation is described in detail under the relevant heading. However, if further general information is required, it can be found within the manual under the pertinent Section heading in the relevant Chapter.

In order that the routine maintenance tasks are carried out with as much ease as possible, it is essential that a good selection of general workshop tools are available.

Included in the kit must be a range of AF ring or combination spanners, a selection of crosshead screwdrivers and at least one pair of circlip pliers.

**Weekly, or every 200 miles**

### *1 Tyres and wheels*

Check the tyre pressures. Always check the pressure when the tyres are cold as the heat generated when the machine has been ridden can increase the pressures by as much as 8 psi, giving a totally inaccurate reading. Variations in pressure of as little as 2 psi may alter certain handling characteristics. It is therefore recommended that whatever type of pressure gauge is used, should be checked occasionally to ensure accurate readings. Do not put absolute faith in 'free air' gauges at garages or petrol stations. They have been known to be in error.

Inspect the tyre treads for cracking or evidence that the outer rubber is leaving the inner cover. Also check the tyre walls for splitting or perishing. Carefully inspect the treads for stones, flints or shrapnel which may have become embedded and be slowly working their way towards the inner tube. Remove such objects with a suitable tool. The thing for getting stones out of horses hooves is ideal!

Check each spoke individually for tension by tapping with a metal object. Any marked difference in the pitch of the noise generated indicates a loose spoke. Bear in mind that a spoke that requires excessive tightening will protrude through the wheel rim and may penetrate the inner tube. In this case the tyre will have to be removed and the spoke end filed flush with the nipple head.

The remarks on spokes do not apply to 1977 models fitted with cast aluminium wheels. Inspection at short intervals is not required.

### *2 Battery*

Check the electrolyte level in the battery and replenish, if necessary, with distilled water. Do not use tap water as this will reduce the life of the battery.

On FL and FLH models the electrolyte in each cell should be flush with the triangle or circle at the base of the filler hole. FX and FXE models are fitted with a battery having a transparent casing. The electrolyte should lie between the upper and lower level marks on the side of the casing. Access to the filler cap(s) on all models can be gained by removal of the chrome top cover, which is retained by a strap and bolt.

### *3 Engine oil*

Check the engine oil level by means of the dipstick which is a push fit in the oil tank. If the level is below the 'refill' mark replenish the tank until the oil level is approximately 1 inch from the top of the tank. Do not overfill, as some airspace is required to prevent leakage. The oil tank cap is secured by a large wing nut which must be slackened before the cap can be removed. Refer to the lubrication specifications for the correct grade of oil.

### *4 Safety check*

Inspect the machine for loose nuts, bolts and ancillary components. Check for fraying cables and damaged brake hoses.

### *5 Legal check*

Ensure that the lights, including the turn indicators, are in good working order and that the horn is functioning correctly. In many areas the correct working of these items are a statutory requirement.

**Monthly or every 1,000 miles**

Complete the checks listed under the weekly/200 mile heading and then carry out the following tasks:

### *1 Air cleaner element*

To gain access to the air filter element, remove the chrome cover which obscures the carburettor. The cover is held by two crosshead screws. Detach the foam element from the supporting frame and thoroughly clean it in a petroleum solvent or petrol. Gently squeeze out excess solvent and allow the sponge to dry. After cleaning, immerse the sponge in engine oil and again squeeze out the excess. Do not wring out the sponge as it is easily torn. The element can now be refitted and the cover replaced. If the machine is used in exceptionally dusty conditions, the filter may require cleaning at more frequent intervals.

## 2 *Rear chain adjustment*

Adjustment of the rear chain is correct if ½ in (1.26 cm) of up and down play can be felt in the centre of the lower chain run. If adjustment is incorrect, remove the split pin from the brake torque arm nut on the caliper, and loosen the nut. Slacken off the wheel spindle and the locknut on each of the adjuster drawbolts. Tighten each adjuster bolt an equal amount until the chain is correctly tensioned. The bolts must always be moved an equal amount, to maintain correct alignment of the rear wheel in the swinging arm fork. If there is any doubt as to wheel alignment, refer to the diagram in Chapter 7 and use a straight wooden plank to check alignment.

After adjustment, tighten the locknuts, the wheel spindle nut and the torque arm nut. Do not omit the split pin.

## 3 *Rear chain lubrication*

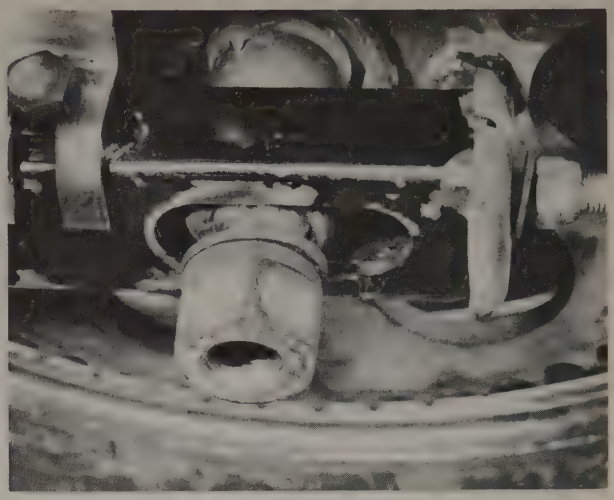
The rear chain is lubricated from an outlet on the oil pump body, which is adjustable by means of a screw with a tapered point. By this means, an optimum rate of flow may be achieved and the correct amount of oil discharged. Because engine oil is relatively thin, it is often found that more oil finds its way onto the rear wheel and adjacent cycle parts than stays on the rapidly moving chain. For this reason it is recommended that one of the proprietary chain lubricants contained in an aerosol can, be used for general chain lubrication. This type of lubricant is much heavier and resists being thrown from the chain. For increased chain life, the chain should be removed for cleaning and lubrication at less frequent intervals, as described under the 2,000 mile/3 monthly routine maintenance heading.

## 4 *Hydraulic brake fluid*

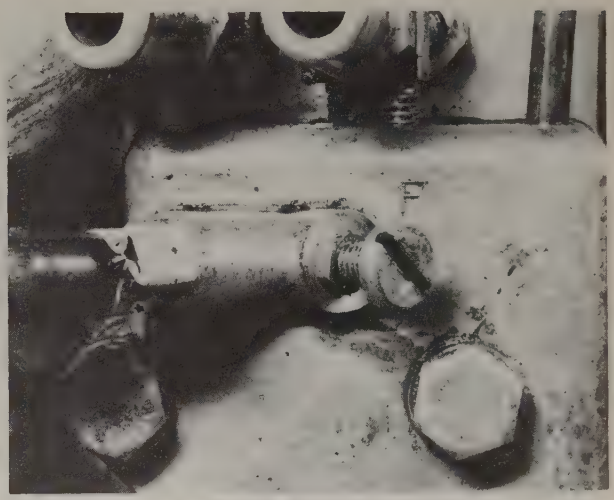
Although the brake fluid level is unlikely to fall perceptibly unless a leakage in either system occurs, a routine safety check of the level should be carried out. The front brake fluid reservoir is incorporated with the handlebar control. To check the level, remove the cover, which is retained by two screws. Before lifting the cover, ensure that the handlebars are positioned so that the reservoir is as horizontal as possible. If this precaution is not observed fluid may spill onto adjacent cycle parts. This should be avoided as brake fluid has excellent paint stripping qualities! The fluid level should be just below the top of the reservoir.

Access to the rear brake fluid reservoir which is located immediately in front of the brake pedal, can be gained after removing the chrome cover, which is retained by a single bolt.

The reservoir cap is in the form of a hexagonal bolt. The fluid level should be just below the level of the orifice threads.



Use drawbolts to move wheel

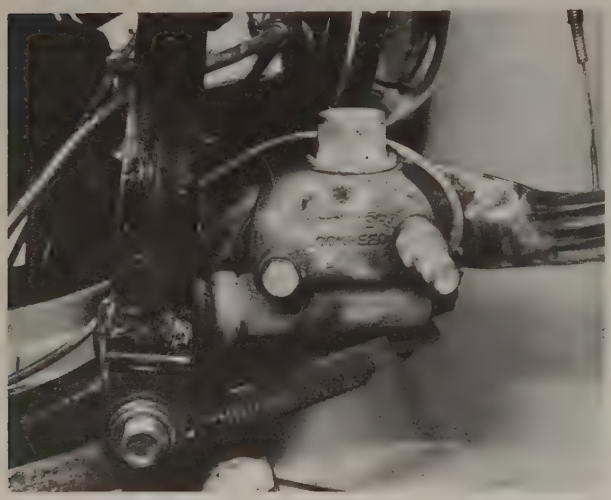


Chain is lubricated automatically from pump but ...

Remove split pin and loosen torque arm nut

... additional lubrication will increase chain life

Check front brake hydraulic fluid level and ...



... also fluid level for rear brake

**Three monthly or every 2,000 miles**

Carry out the tasks under the two previous routine maintenance headings and then complete the following:

### 1 *Engine oil change*

Place a suitable container below the oil tank into which the 4/3.33 US/Imp pints of old oil may be drained. If required, a cardboard or tin shute may be arranged down which the oil may flow into the receptacel. This will prevent oil spillage on to the cycle parts. Drainage can be best accomplished when the engine has reached normal working temperature and hence the oil will be less viscous and will run more easily. Remove the oil filler cap and the dipstick, followed by the drain plug. After draining, lift out the oil filter assembly for cleaning. The filter is housed in a cartridge and may be removed after detaching the filter clip and sealing washer from the upper end of the cartridge tube. The felt filter element must be cleaned thoroughly in a non-flammable solvent and then allowed to dry. Petrol may be used if a suitable solvent is not available. It is important that the filter is absolutely dry before re-use, especially when petrol has been used.

It is recommended that the oil tank be flushed clean at least every second oil change. To flush the tank, replace the drain plug and pour approximately 1 qt of paraffin (kerosene) into the tank. Agitate the paraffin by rocking the machine from side to side. Remove the drain plug and allow the paraffin and displaced sludge to drain out. When refitting the drain plug, ensure that the sealing washer is in good condition.

Replenish the tank with engine oil of the correct grade, until the level is approximately 1 in from the top of the tank. Insert the oil filter assembly and replace the tank cap and the dipstick.

### 2 *Fuel filter cleaning*

A fuel filter is fitted as an integral part of the petrol tap, which consists of a plastic and nylon cylindrical screen that projects into the petrol tank. To gain access to the filter, the petrol tap must be removed after draining the petrol tank of fuel. This operation may be facilitated if carried out when the supply of fuel is low.

Drainage of fuel in the right-hand petrol tank will occur automatically through the feed pipe which passes from the underside of one tank half to the other. To prevent this and so accelerate the draining operation, the pipe can be closed by means of any suitable clamp. Detach the petrol to carburettor feed pipe, either at the tap union or at the carburettor. To remove the tap, unscrew the large hexagonal gland nut above the tap body. Remove any deposits from the filter screen by washing in clean petrol and, if necessary, agitating with a soft brush.

When refitting the petrol tap apply a petrol resistant sealing compound to the threads, to prevent leakage. It should be noted that the gland nut on post 1974 taps has a left-hand thread engaging with the petrol tap and a normal right-hand thread engaging with the boss on the underside of the petrol tank. As the gland nut is tightened the tap and the petrol tank are drawn together.

### 3 *Hydraulic tappet oil screen cleaning*

A cylindrical wire mesh screen is fitted on the oil feed side of the hydraulic tappet system, to prevent the ingress of foreign matter which might block the tiny feed and bleed orifices in the tappets. The filter is housed in a recess in the rear of the timing chest, adjacent to the rear tappet guide block. To gain access to the filter, remove the large slotted plug from the timing chest. The filter and guide spring can then be removed. The slotted plug is often a very tight fit, and therefore a close fitting screwdriver must be used. In some cases the use of an impact screwdriver may be required.

Clean the filter gauze in petrol and then dry thoroughly. Ensure that the filter is refitted with the open end downwards, and that the sealing washer on the plug is not omitted.

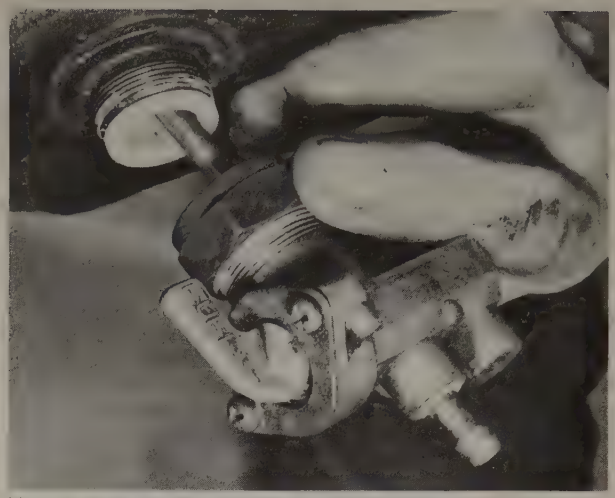
### 4 *Primary chain adjustment*

Place a shallow drain pan below the primary chaincase and remove the eight casing screws. The rear pivot bolt on the footboard must be removed to allow the footboard to be swung down and permit removal of the casing. On some FX and FXE models, the gearchange pedal must be detached from the splines of the pivot shaft. The gearchange pedal is secured by a pinch bolt and nut.

The primary chain tension should be measured at the centre of the upper run and is correct when total up and down movement is 5/8 - 7/8 in (0.625 - 0.875 mm) (engine cold) or 3/8 - 5/8 in (0.375 - 0.625 mm) (engine hot).

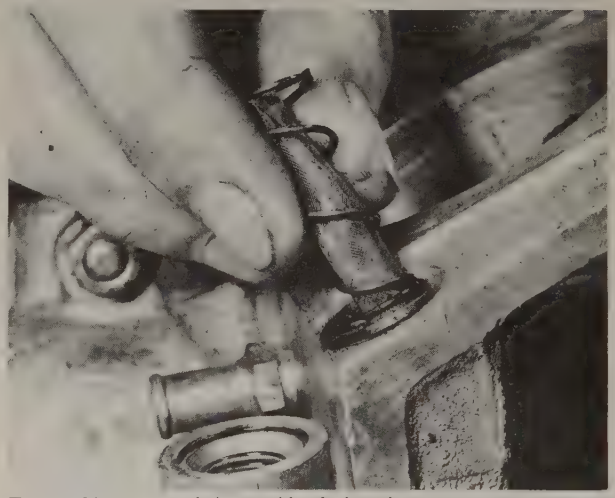
Adjustment is controlled by a tensioning shoe which is retained on a serrated back plate by a single large centre bolt. To adjust the chain, loosen the centre bolt and move the tensioner carrier unit upwards or downwards until the play is as specified. Chain adjustment should always take place with the chain at the tightest point in its rotation. The wear on a set of chain and sprockets is rarely even and as such one or more tight spots may be found. After placing the shoe in the correct position, tighten the centre bolt and recheck the tension. Refit the chaincase, using a new gasket if necessary, and then refit any ancillary components that were removed.

Remove oil tank cap and withdraw filter canister

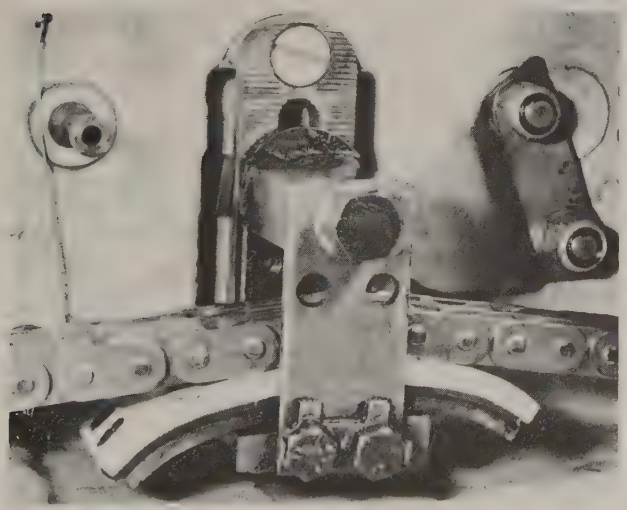


Unscrew petrol tap to

... gain access to filter for cleaning



Tappet filter screen is located in timing chest



Move shoe carrier to tension primary chain

### *5 Contact breaker points, cleaning and resetting*

To gain access to the contact breaker assembly, remove the circular cover plate from the timing chest. The plate is retained by two screws. Rotate the engine until the contact breaker points are in the fully open position. Note that the points operating cam has two lobes of differing sizes. All points adjustment must be made with the moving contact rubbing block in the centre of the larger lobe. Rotation of the engine can be carried out by means of the kickstart. If a kickstart is not fitted, the machine should be placed in top gear and wheeled backwards or forwards, as necessary. Inspect the condition of the points faces. If they are only slightly soiled, the faces may be cleaned with a fine swiss file or emery paper (No. 400) backed by a thin strip of tin. Badly blackened or burned points should be removed for further attention or for renewal as described in Chapter 5, Section 5. Using a feeler gauge, check that the points gap is 0.016 - 0.020 in (0.4 - 0.5 mm). If the gap is incorrect, loosen the contact breaker securing screw and move the fixed contact point nearer to or further away from the moving point, until the blade of the feeler gauge is a light sliding fit. Tighten the centre screw and recheck the gap. The points must be in the **fully open** position during adjustment or a false reading will result.

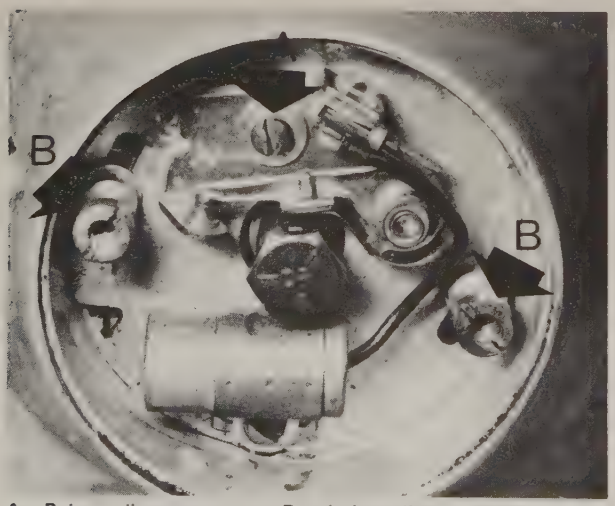
After initial adjustment, rotate the engine further until the points are again fully open with the rubbing block on the smaller (narrower) of the two cam lobes. Check the gap again. The large lobe operates the contact breaker for the rear cylinder, and the small cam for the front cylinder. If the gap varies between the two lobes by more than 0.004 in (0.10 mm) a worn cam or an eccentrically mounted automatic advance unit is indicated. To check for concentricity, loosen the contact breaker cam centre bolt and move the cam and automatic advance unit towards the cam lobe giving the widest points gap. Movement is limited to the amount of play between the advance unit recess and the drive boss projecting from the valve drive camshaft, with which it engages. Tighten the centre bolt and reset the contact breaker points. If this means of correcting eccentricity does not prove satisfactory the cam piece must be renewed.

After adjustment has been carried out, apply a small amount of special cam grease to the operating cam and clean the points faces with methylated spirits or carbon tetrachloride to prevent premature arcing. Do not over lubricate the cam as excess grease may find its way onto the points faces and cause ignition failure. Do not refit the contact breaker inspection cover until the ignition timing has been checked, as described in the next Section.

### 6 *Checking the ignition timing*

The ignition timing should be checked and, if necessary, adjusted whenever major alterations of the contact breaker points have been made, to ensure that ignition timing accuracy is maintained. Accurate ignition timing can only be made with the engine running by using a stroboscope lamp connected with the low or high tension side of the ignition circuit. Connection of the lamp will depend upon the type of unit being used and the recommendations of the manufacturer.

Ignition timing is checked by shining the lamp at the timing marks on the rim of the left-hand flywheel after removing the socket plug from the crankcase. It is best to replace the observation plug with one of clear plastic, otherwise oil spray will create a problem whilst the engine is running. Run the engine at approximately 2000 rpm and observe the position of the timing marks through the transparent plastic cap. Fig. 5.2, Chapter 5, shows the acceptable range. The rear cylinder timing mark is the single deeply drilled dot, which, preferably, should line up with the front cylinder mark which is a vertical line. Ideally the two marks should appear to be superimposed with the timing perfectly correct. Adjustments can be made, after loosening the two contact breaker base plate screws, by rotating the plate by means of a screwdriver inserted in the slot provided. Tighten the plate screw and recheck, before refitting the contact breaker assembly cover plate.




A = Points adjustment screw, B = timing adjustment screws

### 7 *Spark plugs*

Remove both spark plugs and clean them, using a wire brush or a plug blasting machine. Use emery paper or a fine file to square up the electrodes and then reset the points gap of each plug to 0.025 - 0.030 in (0.65 - 0.75 mm), using a feeler gauge. Before refitting the plugs, smear a small amount of graphite grease on the threads, to aid subsequent removal.

### 8 *Rear chain lubrication*

As described under the monthly/1000 miles heading, the rear chain should be lubricated in-situ at short intervals. If rear chain life is to be increased, the chain should be removed from the machine approximately every 2000 miles and cleaned thoroughly, before relubrication in a special graphite chain grease. Before removal of the chain, detach the left-hand pannier (where fitted) and if possible arrange the machine so that the rear wheel is clear of the ground. This will considerably ease chain removal and replacement, which at the best of times is a laborious task. Disconnect the chain at the spring link. If possible connect one end of an old chain to the chain being removed. In this way the old chain will be drawn into position on the sprockets, and then can be used for drawing the relubricated chain into place in a similar manner. If an old chain is not available, a length of string or pliable wire may facilitate replacement. Wash the chain thoroughly in paraffin (kerosene) and then in clean petrol.

The petrol will aid drying of the chain, which is almost impossible if paraffin only is used.

Immerse the clean chain in a molten bath of special grease such as 'Linklyfe' or 'Chainguard'. The heated grease will penetrate into the rollers and will harden on removal. Refit the chain onto the sprockets and replace the spring link. This is facilitated when the two ends of the chain are meshed on the rear wheel sprocket. The closed end of the link must face the direction of normal chain travel.

### 9 *General lubrication*

The following components should be lubricated using an all purpose grease applied by means of a grease gun (where nipples are provided) or directly to the working parts:

*Sliding seat post*
*Seat pivot pins*
*Rear brake and gearchange shafts*
*Swinging arm pivot shaft*
*Speedometer drive gearbox (FX and FXE models)*

In addition the following components should be lubricated with a small amount of engine oil or graphite grease:

*Clutch handlebar lever pivot*
*Front brake handlebar lever pivot*
*Gearchange rod clevis pins*
*Seat post roller and bolt*

## Yearly or every 5000 miles

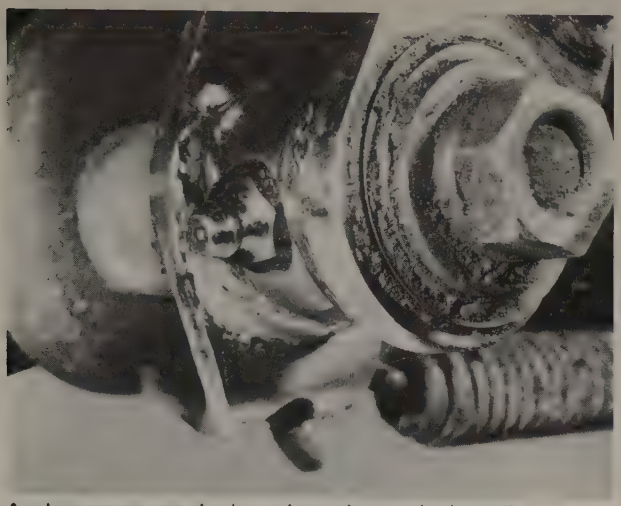
Carry out the tasks listed in the previous schedules except where they conflict with the following and then complete this list of items:

### 1 *Spark plugs*

The manufacturer recommends that the spark plugs be renewed at approximately 5000 mile intervals. Although complete plug failure even after substantially longer use than this is not likely, the plugs should be renewed as recommended, if optimum efficiency is to be maintained.

### 2 *Oil filter renewal*

When changing the engine oil, the old filter should be discarded and a new component fitted. Refer to Section 1 under the 3 monthly/2000 mile heading for oil change procedure and method of removal of oil filter.



Apply grease gun to brake and gearchange nipples and ...

... also to seat post nipple

### 3 *Instrument drive cable lubrication*

The speedometer and tachometer (where fitted) inner drive cables should be removed for lubrication with graphite grease. Access to the cables on machines fitted with front fork mounted instrument heads is straightforward. Detach the cable from each instrument by unscrewing the gland ring. The cable can then be withdrawn. To gain access to the Electra Glide speedometer cable, remove the instrument panel cover which is retained by one screw. Remove the screws which secure the speedometer in position and lift the instrument up as far as possible. Loosen and remove the knurled gland ring to detach the cable. Withdraw the inner cable. On all models apply grease to the entire length of the inner cable, except the last 6 inches. This will prevent the grease from finding its way into the instrument head. Refit the cables by reversing the dismantling procedure. Ensure that the cable ends engage correctly with the drive pieces.

### 4 *Throttle handlebar control lubrication*

*Spiral type*

To gain access to the internal components of the twist grip, insert a large screwdriver through the hole in the end of the handlebar and loosen the large screw. The throttle grip can then be withdrawn, complete with the coil return spring and screw which will remain inside. Apply graphite grease to the sliding components and then refit the grip.

*Drum type*

Separate the two halves of the throttle control drum by removing the two screws. Graphite grease should be applied to the cable inner holder drum and the channel in each drum cover half.

After reassembly of either type of twist grip, ensure that the control works smoothly and does not jam in any position.

### 5 *Steering head bearing adjustment*

The steering head bearings should be checked for play and, if necessary, adjusted as described in Chapter 6, Section 6.

### 6 *Swinging arm fork adjustment*

Check and, if necessary, adjust the lateral play in the swinging arm fork as described in Chapter 6 Section 10.

### 7 *Front fork oil change (FX and FXE models only)*

Drain the damping fluid from each front fork leg and replenish with the correct grade and quantity. Refer to Chapter 6, Section 7 for the correct procedure.

### 8 *Tyre switching (Electra Glide only)*

In order to equalise the wear of the tyres and so increase tyre life, the manufacturers recommend that the front tyre is refitted on the rear wheel and vice versa. Details for removal of the front and rear wheels can be found in Chapter 7, Section 2 and Section 10 respectively. The procedure for tyre removal and replacement is detailed in Chapter 7, Section 17.

## 2 yearly or every 10000 miles

Remove the wheel bearings from both wheels as described in Chapter 7, Section 5. Clean the bearings and repack them with grease, as specified. If the machine is used during harsh winter climates, the manufacturers recommend that this procedure should be carried out at 1 year/5000 mile intervals.

## General maintenance items

### 1 *Brake pad examination and replacement*

The rate of brake pad wear is dependent on the conditions in which the machine operates, the weight carried and the style of riding. In consequence it is difficult to advise on specific inspection intervals. Whatever inspection interval is chosen, bear in mind that the rate of wear will not be constant and that the front brake pads will wear at a greater rate than those of the rear brake.

*Rear brake (all models) and front brake (except FX and FXE 1974 on)*

The caliper unit type is common to both front and rear wheels and can be dismantled for brake pad examination and renewal, without the need to remove the wheel in question.

Access to the rear brake caliper requires the removal of the right-hand pannier box.

To dismantle the caliper unit, remove the four bolts which clamp the two halves of the caliper together. Detach the outer half of the caliper followed by the damper spring (front brake only). The inner caliper half can be lifted off the mounting pin, which passes through the caliper bracket. Lift off the brake pads and separate them from the two mounting pins. Mark each pad with chalk to aid replacement in the same position.

The brake pads must be renewed as a set if the friction material on either pad has worn to less than 1/16 in (1.6 mm). Refit the pads by reversing the dismantling procedure. Clean all the components before reassembly and apply a light smear of graphite grease to the pad pins and the main mounting pin. **Do not** over lubricate, or grease may find its way onto the pad faces causing loss of braking efficiency.

*Front brake (FX and FXE 1974 on)*

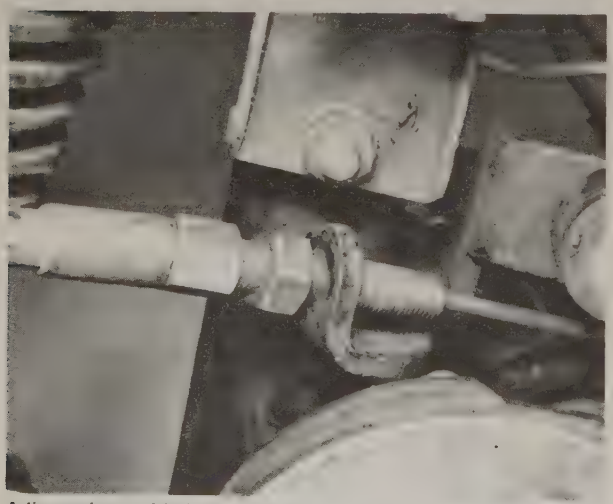
The front brake caliper can be dismantled for brake pad examination and renewal, without first removing the wheel.

Unscrew the two Allen screws which pass through the caliper body, after removing the two nuts and washers from the rear of the inner half. Pull the two halves of the caliper apart and remove the pad carrier from the outer half. The inner pad is attached to the inner caliper half. The condition of pad wear may be ascertained by the wear limit groove on the lower edge of each pad. If either pad has worn down to the groove, the pads must be renewed as a set. Each is retained in position by two rivets, which may be drilled from position. Care should be taken not to drill a rivet off-centre and so enlarge the rivet holes in the pad carrier. The correct drill size is 9/64 inch. When refitting the pads, insert the rivets from the pad side and peen them into position in the carrier, in a manner similar to that of the original rivets. It is important that the pads are securely held by the rivets, or they will shear from position in service. Refit the caliper by reversing the dismantling procedure. Apply a small amount of graphite grease to the pins upon which the outer pad carrier is mounted. **Do not** overgrease as the lubricant may find its way onto the pads and so reduce braking efficiency.

## 2 *Clutch cable adjustment*

In common with brake pad wear, clutch wear and the resultant necessary adjustment depends upon the operating conditions and the style of riding.

Adjustment, when required, should be carried out in two stages, as follows: Move the clutch operating arm on the gearbox forward until all play has been taken up. In this position, measure the distance between the starter motor casing and the clutch arm The distance should be 3/8 - 5/8 in (9.5 - 16.0 mm). If the distance is incorrect, adjustment should be made with the adjuster screw in the clutch pressure plate. To gain access to the screw, remove the clutch inspection cover, which is retained by three screws. Slacken the sleeve locknut which screws secures the screw and turn the screw inwards or outwards until the gap at the arm is ½ in (12.5 mm). When the adjustment is correct, tighten the locknut and replace the clutch inspection cover.



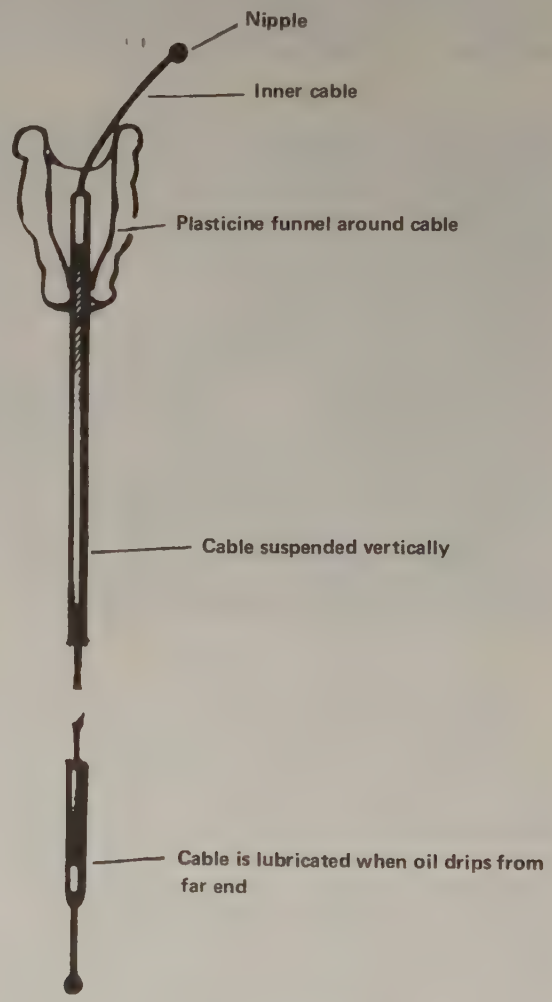
Adjuster is provided on clutch control cable

Adjustment of free play at the handlebar lever can now be made. Adjustment is correct if the handlebar lever can move approximately ¼ in (6 mm) before clutch disengagement commences.

Adjustment is effected by means of the cable adjuster, which screws into the cable abutment lug bolted to the seat post tube.

## 3 *Control cable lubrication*

The control cables should be lubricated from time to time, the intervals for attention depending largely on the weather conditions in which the machine is used. Use motor oil or an all-purpose oil to lubricate the control cables. A good method for lubricating the cables is shown in the accompanying illustration, using a plasticine funnel. This method has a disadvantage in that the cables usually need removing from the machine. An hydraulic cable oiler which pressurises the lubricant, overcomes this problem. Do not lubricate nylon lined cables as the oil will cause the nylon to swell, thereby causing total cable seizure.




Oiling a control cable

# Working conditions and tools

When a major overhaul is contemplated, it is important that a clean, well-lit working space is available, equipped with a workbench and vice, and with space for laying out or storing the dismantled assemblies in an orderly manner where they are unlikely to be disturbed. The use of a good workshop will give the satisfaction of work done in comfort and without haste, where there is little chance of the machine being dismantled and reassembled in anything other than clean surroundings. Unfortunately, these ideal working conditions are not always practicable and under these latter circumstances when improvision is called for, extra care and time will be needed.

The other essential requirement is a comprehensive set of good quality tools. Quality is of prime importance since cheap tools will prove expensive in the long run if they slip or break and damage the components to which they are applied. A good quality tool will last a long time, and more than justify the cost. The basis of any tool kit is a set of open-ended spanners, which can be used on almost any part of the machine to which there is reasonable access. A set of ring spanners makes a useful addition, since they can be used on nuts that are very tight or where access is restricted. Where the cost has to be kept within reasonable bounds, a compromise can be effected with a set of combination spanners - open-ended at one end and having a ring of the same size on the other end. Socket spanners may also be considered a good investment, a basic 3/8 or ½ inch drive kit comprising a ratchet handle and a small number of socket heads, if money is limited. Additional sockets can be purchased, as and when they are required. Provided they are slim in profile, sockets will reach nuts or bolts that are deeply recessed. When purchasing spanners of any kind, make sure the correct size standard is purchased. Almost all machines manufactured outside the UK and USA have metric nuts and bolts, whilst those produced in Britain have BSF or BSW sizes. The standard used in the USA is AF, which is also found on some of the later British machines. Other tools that should be included in the kit are a range of crosshead screwdrivers, a pair of pliers and a hammer.

When considering the purchase of tools, it should be remembered that by carrying out the work oneself, a large proportion of the normal repair cost, made up by labour charges, will be saved. The economy made on even a minor overhaul will go a long way towards the improvement of a tool kit.

In addition to the basic tool kit, certain additional tools can prove invaluable when they are close to hand to help speed up a multitude of repetitive jobs. For example, an impact screwdriver will ease the removal of screws that have been tightened by a similar tool, during assembly, without risk of damaging the screw heads. And, of course, it can be used again to retighten the screws, to ensure an oil or airtight seal results. Circlip pliers have their uses too, since gear pinions, shafts and similar components are frequently retained by circlips that are not too easily displaced by a screwdriver. There are two types of circlip pliers, one for internal and one for external circlips. They may also have straight or right-angled jaws.

One of the most useful of all tools is the torque wrench, a form of spanner that can be adjusted to slip when a measured amount of force is applied to any bolt or nut. Torque wrench settings are given in almost every modern workshop or service manual, where the extent to which a complex component, such as a cylinder head, can be tightened without fear of distortion or leakage. The tightening of bearing caps is yet another example. Overtightening will stretch or even break bolts, necessitating extra work to extract the broken portions.

As may be expected, the more sophisticated the machine, the greater is the number of tools likely to be required if it is to be kept in first class condition by the home mechanic. Unfortunately, there are certain jobs which cannot be accomplished successfully without the correct equipment and although there is invariably a specialist who will undertake the work for a fee, the home mechanic will have to dig more deeply in his pockets for the purchase of similar equipment if he does not wish to employ the service of others. Here a word of caution is necessary, since some of these jobs are best left to the expert. Although an electrical multimeter of the Avo type will prove helpful in tracing electrical faults, in inexperienced hands it may irrevocably damage some of the electrical components if a test current is passed through them in the wrong direction. This can apply to the synchronisation of twin or multiple carburettors too, where a certain amount of expertise is needed when setting them up with vacuum gauges. These are, however, exceptions. Some instruments, such as a strobe lamp, are virtually essential when checking the timing of a machine powered by CDI ignition system. In short, do not purchase any of these special items unless you have the experience to use them correctly.

Although this manual shows how components can be removed and replaced without the use of special service tools (unless absolutely essential), it is worthwhile giving consideration to the purchase of the more commonly used tools if the machine is regarded as a long term purchase. Whilst the alternative methods suggested will remove and replace parts without risk of damage, the use of the special tools recommended and sold by the manufacturer will invariably save time.

# Recommended lubricants

| Component | Harley-Davidson grade | Alternative type |
|---|---|---|
| Engine | Medium heavy 75 (Above 40°F)<br>Special light 58 (Below 40°F)<br>Regular heavy 105 (for use in severe high temperatures) | 20W/50 |
| Gearbox | As above | SAE 50 monograde |
| Front forks | Type B | Fork oil |
| Final drive chain | Chain grease | Graphite grease |
| All greasing points | Grease-All | Multi-purpose high melting point |

# Quick glance maintenance adjustments and capacities

| | |
|---|---|
| Oil tank capacity ... ... ... ... ... ... ... | 4/3.33 US/Imp qts (1.90 litres) |
| Gearbox capacity ... ... ... ... ... ... ... | 1.5/1.2 US/Imp pints (0.7 litres) |
| Contact breaker gap ... ... ... ... ... ... | 0.016 - 0.020 in (0.4 - 0.5 mm) |
| Spark plug gap ... ... ... ... ... ... ... | 0.025 - 0.030 in (0.65 - 0.75 mm) |

# Chapter 1 Engine

**Contents**


General description ... 1
Operations with engine in frame ... 2
Operations with engine removed ... 3
Method of engine unit removal ... 4
Removing the engine unit from the frame ... 5
Engine removal: removing the primary drive and clutch ... 6
Removing the engine unit: final procedure ... 7
Dismantling the engine unit: general ... 8
Dismantling the engine unit: removing the cylinder heads and barrels ... 9
Dismantling the engine unit: removing the tappets and tappet blocks ... 10
Dismantling the engine unit: removing the timing chest and timing pinions ... 11
Dismantling the engine unit: removing the oil pump ... 12
Dismantling the engine unit: removing the alternator ... 13
Dismantling the engine unit: separating the crankcase halves ... 14
Examination and renovation: general ... 15
Big-end and main bearings: examination and renovation ... 16
Small-end bearing and gudgeon pin: examination and renovation ... 17
Cylinder barrels: examination and renovation ... 18
Pistons and piston rings: examination and renovation ... 19
Cylinder heads: dismantling, examination and renovation of the valves, valve seats and valve guides ... 20
Rocker boxes: dismantling, examination and renovation ... 21
Hydraulic tappets: examination and renovation ... 22
Timing pinions and timing chest bearings: examination and renovation ... 23
Crankcase castings: examination and renovation ... 24
Oil seals: examination and renovation ... 25
Reassembling the engine unit: general ... 26
Engine reassembly: joining the crankcase halves ... 27
Engine reassembly: refitting the oil pump ... 28
Engine reassembly: replacing the timing pinions and timing the camshaft and breather ... 29
Engine reassembly: replacing the automatic advance unit and contact breaker ... 30
Engine reassembly: replacing the cam followers ... 31
Engine reassembly: replacing the cylinder barrels ... 32
Engine reassembly: replacing the rocker boxes and cylinder heads ... 33
Engine reassembly: replacing the alternator ... 34
Replacing the engine unit in the frame ... 35
Engine reassembly: replacing the primary drive and clutch ... 36
Completion of engine reassembly ... 37
Starting and running the rebuilt engine ... 38
Taking the rebuilt machine on the road ... 39
Fault diagnosis: engine ... 40


**Specifications**

| | FL | FLH and FX |
|---|---|---|
| **Engine general** | | |
| Type | Air-cooled, 4-stroke, 45° V-twin | |
| Bore | 87.3 mm (3.437 in) | |
| Stroke | 100.8 mm (3.968 in) | |
| Capacity | 1207 cc (73.66 cu in) | |
| Compression ratio | 7.25 : 1 | 8 : 1 |
| bhp | 57 @ 5200 rpm | 66 @ 5200 rpm |
| **Tolerances and wear limits** | | |
| Valves: | | |
| Valve/guide clearance | | |
| Inlet | 0.004 - 0.006 in (0.10 - 0.15 mm) | |
| Exhaust | 0.002 - 0.004 in (0.05 - 0.10 mm) | |
| Valve springs: | | |
| Outer spring free length | 1 31/32 in (50.0 mm) | |
| Inner spring free length | 1 25/64 in (35.3 mm) | |
| Rocker arms: | | |
| Spindle/rocker bush clearance | 0.0005 - 0.002 in (0.012 - 0.05 mm) | |
| Rocker arm end float | 0.004 - 0.025 in (0.10 - 0.65 mm) | |

| | |
|---|---|
| **Pistons and rings:** | |
| Piston/bore clearance | 0.001 - 0.002 in (0.025 - 0.05 mm) |
| Compression ring side clearance | 0.004 - 0.005 in (0.10 - 0.127 mm) |
| Oil control ring side clearance | 0.003 - 0.004 in (0.076 - 0.10 mm) |
| End gap | 0.010 - 0.020 in (0.254 - 0.508 mm) |
| **Connecting rod:** | |
| Gudgeon pin/small-end play | 0.0008 - 0.0012 in (0.020 - 0.030 mm) |
| Big-end axial float | 0.005 - 0.025 in (0.127 - 0.65 mm) |
| Big-end radial clearance | 0.001 - 0.0015 in (0.025 - 0.027 mm) |
| **Tappets:** | |
| Tappet/guide clearance | 0.001 - 0.002 in (0.025 - 0.05 mm) |
| Roller radial fit | 0.0005 - 0.001 in (0.012 - 0.025 mm) |
| Roller end float | 0.008 - 0.010 in (0.203 - 0.25 mm) |
| **Timing chest:** | |
| Breather pinion end float | 0.001 - 0.005 in (0.025 - 0.127 mm) |
| Camshaft/bush clearance | 0.001 - 0.0015 in (0.025 - 0.027 mm) |
| Camshaft/bearing clearance | 0.0005 - 0.003 in (0.012 - 0.076 mm) |
| Camshaft end float | 0.001 - 0.005 in (0.025 - 0.127 mm) |
| Oil pump spindle/bush clearance | 0.0008 - 0.0012 in (0.020 - 0.030 mm) |
| **Flywheel assembly:** | |
| Flywheel maximum runout | 0.003 in (0.076 mm) |
| Mainshaft maximum runout | 0.001 in (0.025 mm) |
| Flywheel assembly end float | 0.001 - 0.006 in (0.025 - 0.152 mm) |
| Timing side main bearing axial play | 0.0004 - 0.0008 in (0.01 - 0.02 mm) |
| Timing cover bush/mainshaft play | 0.0005 - 0.0012 in (0.012 - 0.027 mm) |

| **Torque wrench settings** | **ft lbs** | **kg m** |
|---|---|---|
| Timing pinion nut | 25 - 35 | 3.456 - 4.835 |
| Oil pump bolt or stud nut | 50 - 60 | 0.553 - 0.691 |
| Crankpin nuts | 200 | 27 - 65 |
| Rocker cover nuts | 15 | 2.087 |
| Cylinder head nuts | 65 | 8.985 |
| Cylinder barrel nuts | 45 | 6.221 |

## 1 General description

The engine unit fitted to the Harley-Davidson Electra Glide and Super Glide range is a large capacity 45° V-twin, mounted in line with the frame. The engine/gearbox arrangement is of the so called pre-unit construction type, where the gearbox is a remote and self-contained unit, mounted behind the engine in the traditional manner.

Aluminium alloy castings are used throughout, with the exception of the cylinder barrels, which are in cast iron. The massive flywheel assembly consists of two full flywheels and mainshafts, interconnected by a taper fit crankpin, upon which the triple row caged roller big-end bearing is mounted. The connecting rods are mounted in line with each other by means of a forked rear connecting rod into which the narrower front connecting rod is fitted. The flywheel assembly is supported by two taper roller bearings on the drive side and by two needle roller bearings on the timing side. The engine utilizes overhead valve gear, which is operated by pushrods driven via hydraulic tappets from a single four-lobe camshaft situated in the timing chest. A gear-type oil pump provides lubrication for the working components via internal and external oilways. In addition, the oil pump provides lubrication to the primary chaincase and to the final drive chain, and also to the hydraulic tappets. An electric starter motor is fitted to the FL, FLH and the FXE models. The FX is fitted with a kickstart as standard but can be fitted with an electric start system in addition.

## 2 Operations with engine in frame

1 Removal of the engine from the frame is not strictly necessary unless separation of the crankcase halves is required for access to the flywheel assembly and main bearings or renewal of the camshaft bearings. The cylinder heads and cylinder barrels can be detached with the engine in-situ, although if additional work on the engine is planned, and sufficient time is available, better access can be gained after removal of the engine.

2 Operations that can be completed with the engine in frame include removal and replacement of:

1 *Cylinder heads and cylinder barrels*
2 *Alternator*
3 *Starter motor*
4 *Clutch and primary transmission*
5 *Camwheels and timing gear*

3 When several operations need to be undertaken simultaneously or when a major overhaul is contemplated, it will probably be advantageous to remove the complete engine unit from the frame. This will give the advantage of better access and more working space.

## 3 Operations with engine removed

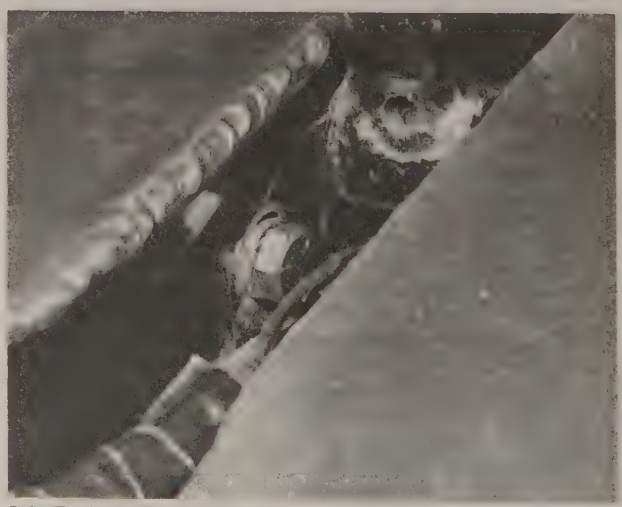
1 Removal and replacement of the main bearings.
2 Removal and replacement of the crankshaft assembly.
3 Renewal of camshaft bush and bearing.

## 4 Method of engine unit removal

1 The engine may be lifted from the frame as a complete unit, after removal of the ancillary components and after detaching the main control systems. In spite of the wide use of aluminium alloy, the engine is extremely heavy and will require at least three people to lift it from position. The problem is compounded by the close proximity of the frame tubes and some less easily detachable cycle parts. Removal of the cylinder head, cylinder barrels and pistons will lighten the engine substantially, thereby making engine removal easier. If the cylinder barrels and heads are detached before engine removal is carried out, a slightly modified method of engine removal should be adopted by referring to the relevant sections in this Chapter.

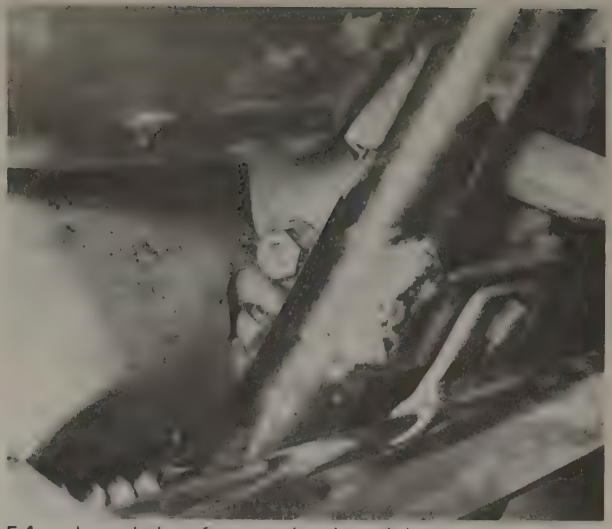
### 5 Removing the engine unit from the frame

1 As the machine is not fitted with a centre stand, it is suggested that the initial dismantling should be accomplished with the machine resting on the prop stand, unless some form of rigid stand is available, like that used in many repair shops. Because the lower tubes of the cradle frame are somewhat close together, the machine will not be too stable if it is rested on packing placed under these tubes.
2 If the machine is rested on the prop stand, ensure it is standing firmly on level ground and that the wheels are chocked, so that it is not possible for it to roll forward.
3 Disconnect the petrol feed pipe, either at the tap union or at the carburettor, after ensuring that the tap is in the 'OFF' position. Using the existing feed pipe or a suitable length of tube, drain the petrol into a clean container. Disconnect the rubber balance pipe which runs from one tank half to the other. The pipe is retained at each union by a heavy spring clip. To release the pressure on the hose, squeeze the ears of the clip together with a large pair of pliers or a self-grip wrench. Removal of the one-piece Super Glide petrol tank is more straightforward. The front of the tank is secured by a single bolt running horizontally through the head stock and passing through the lugs welded to the tank. The rear of the tank is retained by a coil spring, which hooks onto tabs attached to the tank. After removal of the bolt, and spring, the tank can be lifted from position.
4 The petrol tank fitted to the Electra Glide consists of two separate containers retained independently at the top rear by two bolts, and by two long bolts passing through lugs in the frame and lugs on the tank. Commence tank removal by detaching the instrument panel cover. The cover is retained by a single central screw. Remove the pin upon which the Buddy seat is supported at the seat post. The pin is retained by a heavy wire clip which locates with the seat frame. Hinge the seat upwards to its full extent and support it in this position, using a suitable length of rod or dowel placed between the seat pan and the workshop floor. Remove the two most forward bolts first, and then remove the final setscrew (bolt) holding each tank half.
5 Detach the Buddy seat from the machine by removing the pivot bolt from the front of the seat frame (Electra Glide models only).
6 Place a container of more than 4/3.33 US/Imp. quarts below the oil tank and remove the oil filler cap and the drain plug. Allow all the oil to drain and replace the drain plug.
7 Detach the footboards (where fitted) by removing the thin nut from each pivot pin and carefully driving each pin out. The bracket supporting the rear of the right-hand footboard should be removed also. The bracket is held by a single bolt. Loosen the pinch bolt and pull the kickstart lever off the shaft (where fitted).
8 Loosen and remove the single socket bolt which passes through the exhaust pipe flange at each exhaust port. Where fitted, detach the chrome pipe guards by unscrewing completely the hidden screw clips. On Electra Glide models, the left-hand exhaust pipe is secured by a single bolt which passes into the clutch housing. Slacken off all the silencer/pipe and pipe-to-pipe clamps. Detach the silencers either by removing the silencer bracket bolts or by detaching the silencer and the bracket from the frame as a complete unit. In some cases it may be possible to remove the exhaust system without first separating the exhaust pipes from the silencers. A rawhide mallet may be used to separate the pipes at the cylinder heads or at the pipe joints, if difficulty is experienced. If the joints have rusted together and defy removal in the normal manner, copious quantities of a freeing agent or penetrating oil may prove beneficial. Allow plenty of time for the oil to penetrate before reattempting removal.
9 Remove the battery retaining strap, the upper chrome cover and the battery box (where fitted). Disconnect the main battery leads and lift the battery away. On electric start models, the battery carrier must be detached, to enable subsequent removal of the starter motor. Disconnect the leads to the starter relay and then loosen the carrier mounting bolts. If required, mark the wiring leads to aid reassembly.
10 Remove the forwardmost right-hand foot rest, complete with the bracket upon which it is supported. The bracket is retained on the gearbox by two of the gearbox cover nuts. The foot rest shaft fitted to the Super Glide models serves also as the rear brake pedal pivot. The brake operating pushrod will leave the master cylinder on removal of the bracket, and therefore the assembly may be detached as a complete unit.
11 Detach all the oil feed pipes from the unions at the oil pump body, after removing the oil pressure light lead which is retained on the switch by a nut. Each oil pipe is secured on its union by a crimped aluminium clip. Prise the clip apart at the crimped portion with the blade of a screwdriver. If care is taken, it may be possible to re-use the clips, although they usually fracture on re-crimping. Before removal of the oil pipes it is wise to inspect them carefully for routing and positioning. If necessary, sketch the correct route to aid reassembly. Detach the crankcase breather pipe in a similar manner.
12 Remove the air filter cover, which is retained by two large screws, followed by the four large screws and star washers which hold the filter backplate in place. Disconnect the choke cable at the carburettor lever by unscrewing the anchor screw. On Bendix carburettors, the throttle cable is retained in a similar manner. The throttle cable on Keihin carburettors passes around a small pulley. To disconnect the cable, rotate the pulley until the cable nipple can be detached. Loosen and remove the two nuts which hold the carburettor onto the induction manifold flange. Note the fuel feed pipe guide retained on the lower stud. Pull the carburettor from position as a unit. The Bendix carburettor is fitted with a gasket, whereas the Keihin instrument has an 'O' ring to ensure a gastight joint between the two flange faces.
13 Detach the HT leads at the spark plugs and remove the ignition coil chrome cover. The cover is retained by two bolts. Disconnect the low tension wires from the terminals at the top and the base of the coil, by removing the small nut. The ignition coil can now be detached from the frame, where it is held by two bolts. Pull the low tension wire which runs to the contact breaker, through to the right-hand side of the machine and secure it to the engine to prevent it becoming snagged on engine removal.

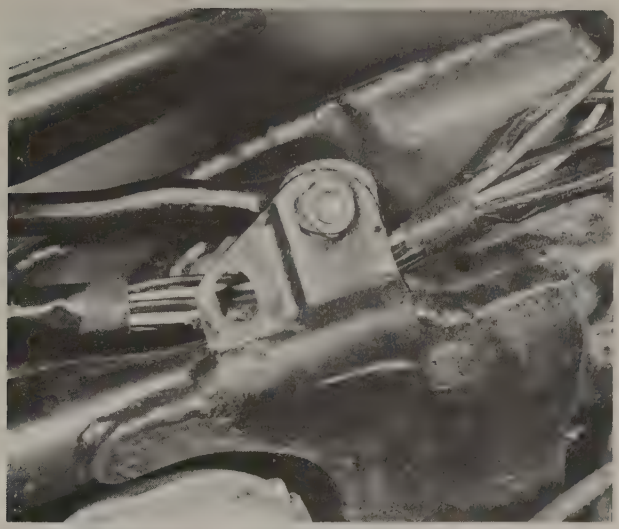


5.4a Tank halves held by one bolt each and ...

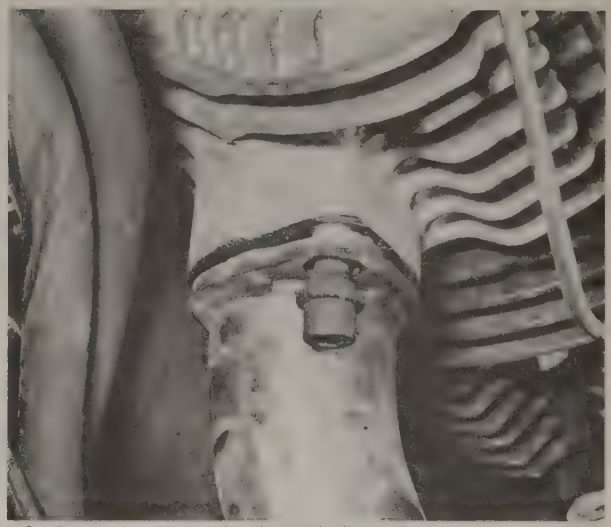
5.4b ... by an upper bolt and ...



5.4c ... lower bolt at front passing through lugs

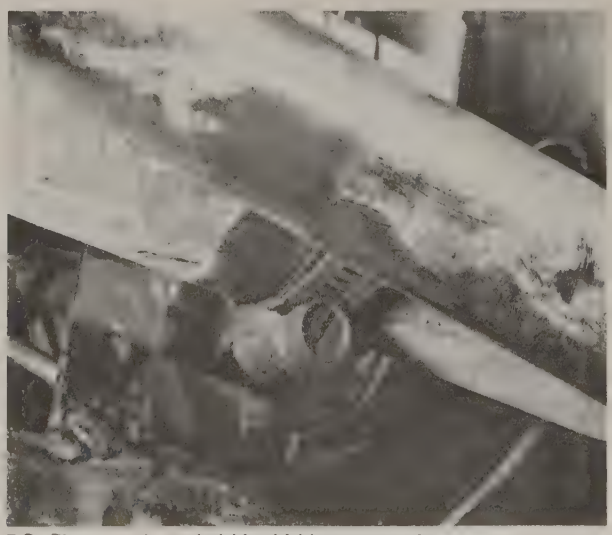


5.5 Buddy seat is held by a pivot bolt at front



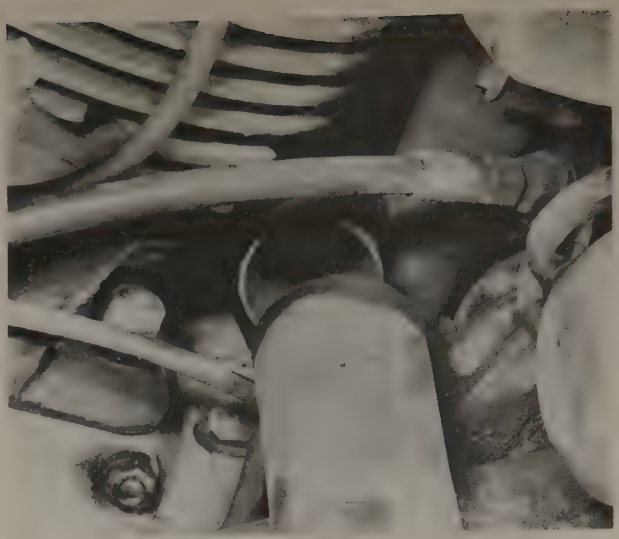
5.8a Remove exhaust pipe flange bolts and ...

5.8b ... silencer mounting bolts

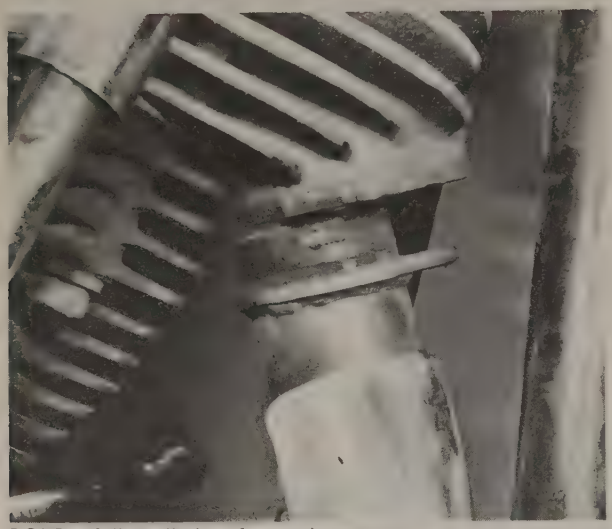


5.8c Pipe guards are held by hidden screw clips

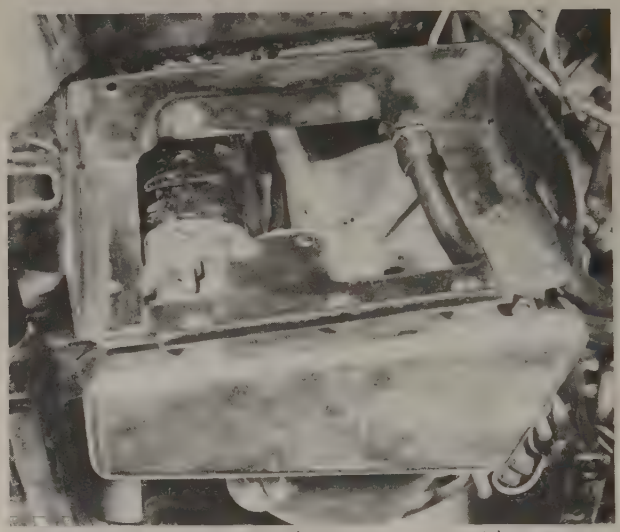
5.8d Remove left-hand pipe bolt (Electra Glide) and ...



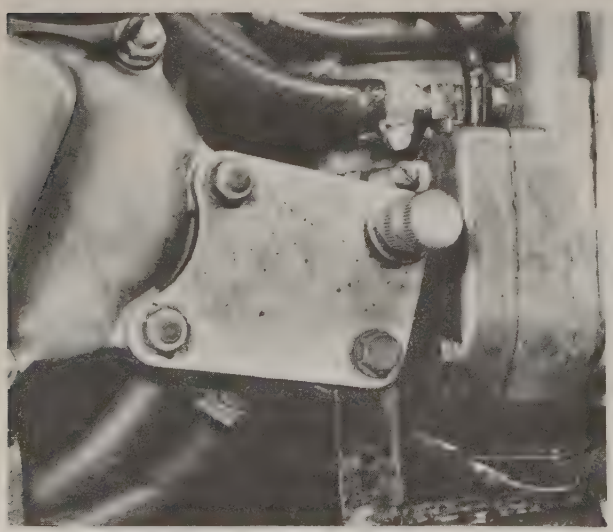
5.8e ... separate from main exhaust system



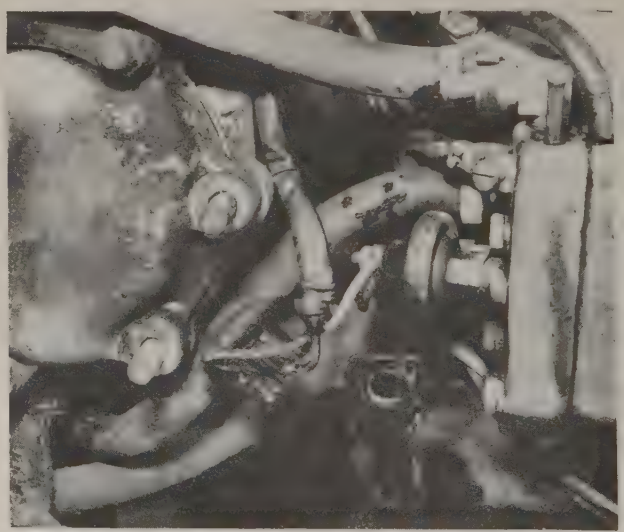
5.8f Carefully pull pipes from exhaust ports



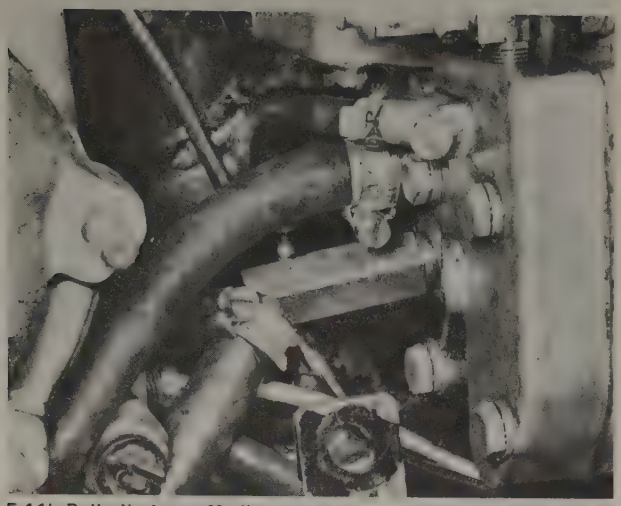
5.9a Detach the battery cover (Electric start models)

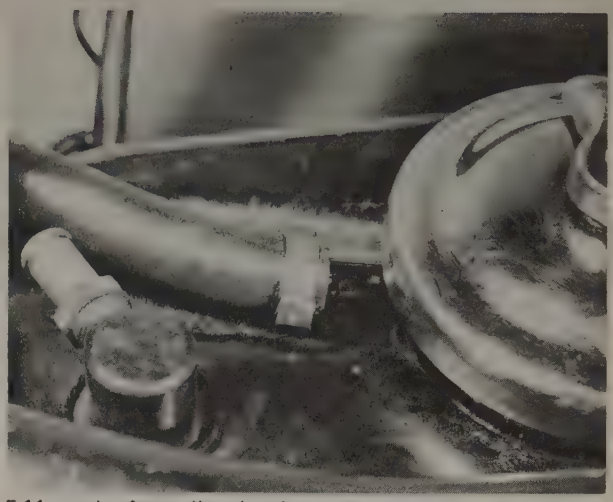


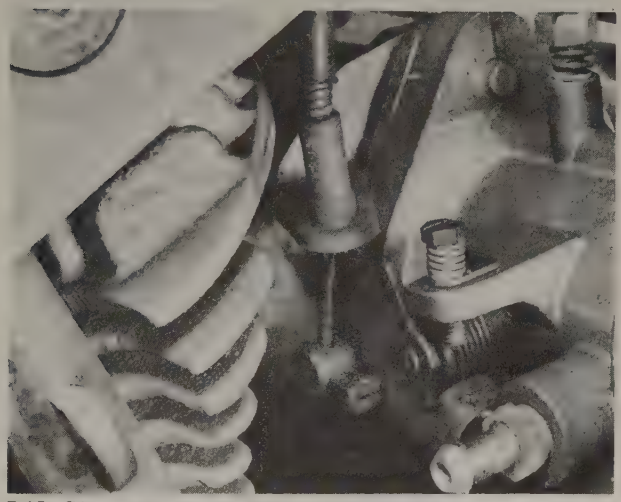
5.10 Detach right-hand footrest and bracket



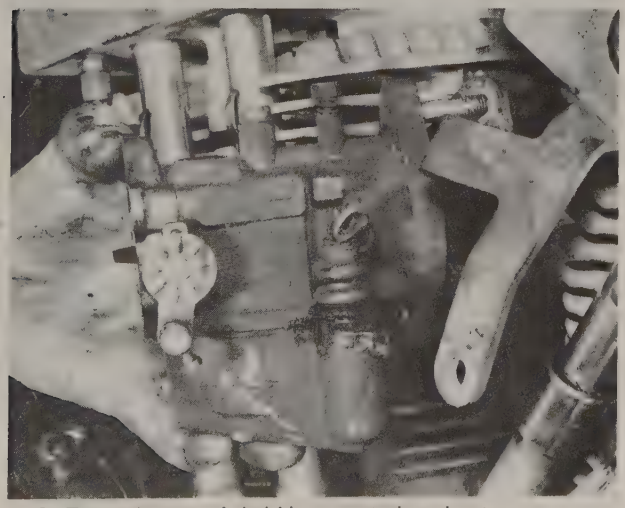
5.11a Disconnect oil pressure lead and unscrew the switch


5.11b Pull oil pipes off oil pump and ...


5.11c ... also from oil tank unions


5.12a Disconnect the throttle cable followed by ...

5.12b ... the choke operating cable

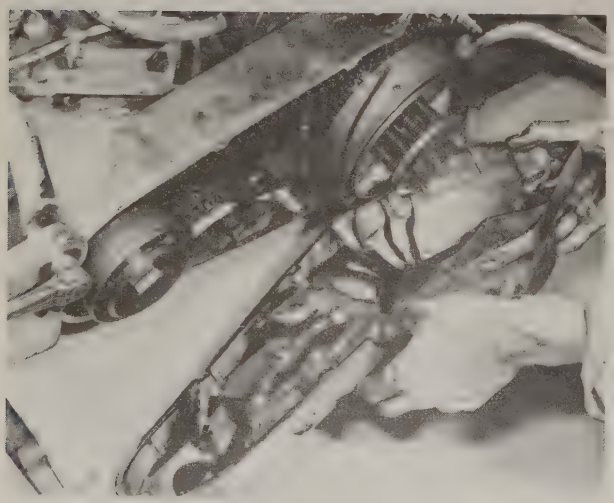

5.12c The carburettor is held by two studs and nuts

## 6 Engine removal: removing the primary drive and clutch

1 Loosen the eight primary chaincase retaining screws evenly and remove them. Pull the chaincase cover from position after breaking the gasket seal, using a rawhide mallet. If necessary, remove the gearchange pedal to allow cover removal. The pedal is secured on the splined shaft by a pinch bolt.

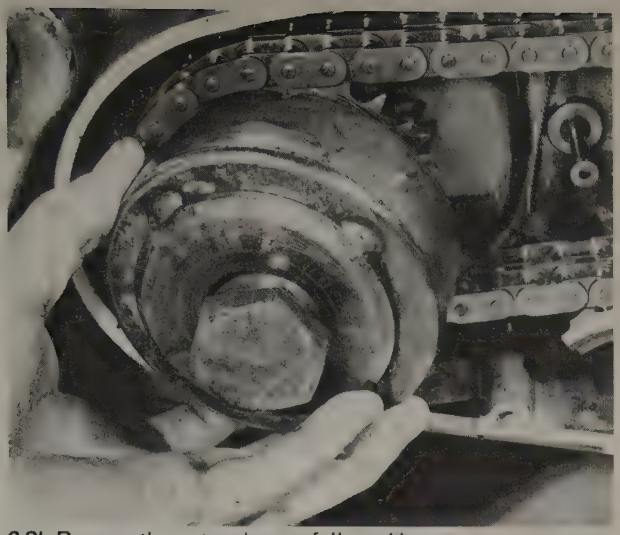
2 Commence primary drive removal by loosening the engine sprocket sleeve nut. The nut is usually very tight and will therefore require the use of a close fitting spanner with a suitable long handle with which to apply sufficient leverage. To prevent the nut from rotating, place the machine in top gear and, using a length of string, tie the foot brake pedal in the fully on position. Some models are fitted with a sprocket nut that requires a special peg spanner for removal and assembly. Harley-Davidson service tool No. 94557-55 is recommended, but it is unlikely to be freely available. In this case a suitable spanner will have to be fabricated, which incorporates four pegs which will engage with the face of the nut. After loosening remove the nut, followed by the large cam boss, or in the case of machines with the peg nut, the shock absorber unit.

3 Free the complete chain tensioner unit by removing the large bolt which passes through the central block and secures the assembly to the rear of the chaincase.
4 The clutch spring backplate, the springs and the clutch pressure plate are removed as a unit. Because the two plates are under considerable pressure from the springs, a special procedure must be adopted to ensure safe removal. Loosen and remove the clutch adjusting screw locknut. Place a large washer, whose outside diameter is greater than the central hole in the spring plate, over the adjuster screw and refit the locknut. Tighten the locknut until the springs are compressed slightly. The three spring tensioning nuts can now be unscrewed and the plate/spring unit removed in safety. The unit need only be separated if one or more of the components require renewal. To separate the unit safely, insert three bolts through the original fixing holes and fit a nut to each bolt. Tighten the nuts until the springs are compressed slightly and then remove the locknut and adjuster screw. Separate the unit by loosening the three nuts progressively and evenly. The bolts must have threads of sufficient length to allow complete releasing of the spring pressure.
5 Withdraw the clutch operating pushrod from the hollow mainshaft. Remove the clutch plates, one at a time, noting their relative positions to aid reassembly. Grasp the clutch outer drum with one hand and the engine sprocket with the other, and lift the two components off simultaneously, complete with the primary chain and chain tensioner.
6 Loosen and remove the clutch centre nut after knocking down the ears of the tab washer. Note that this nut has a left-hand thread and must therefore be undone in a clockwise direction. The clutch centre boss is fitted on a tapered portion of the gearbox mainshaft and is located by a Woodruff key. Due to this, the centre boss will be very tight and will require drawing from position. A suitable puller can be fabricated with ease, using a circular plate of 1/8 inch or 1/4 inch steel, a long bolt and a nut. The plate should be drilled to fit over the three longest studs projecting from the clutch boss, so that it can be retained by the three spring tension nuts. A central hole must also be drilled, to take the long bolt, the nut of which should be fitted to the inside of the plate. Before fitting the puller, screw the centre nut onto the mainshaft approximately half a dozen turns, to prevent the shaft threads from becoming damaged from the pressure of the bolt. The clutch pushrod oil seal, fitted into the end of the nut must also be protected from the end of the bolt by a suitable washer. After removal of the clutch centre, prise the Woodruff key from the shaft, using the blade of a screwdriver.
7 On electric start models, the starter motor should now be detached, and the starter solenoid disconnected. Carefully prise the rubber cap off the solenoid, which is mounted on the chaincase inner. Disconnect the two main leads and the smaller low tension lead. When loosening the main terminal nuts, ensure that the terminal post is supported, to prevent terminal rotation and consequent damage to the unit.
8 Working on the right-hand side of the machine, disconnect the single lead attached to the starter motor end cap. The lead is held by a nut. Detach the clutch operating lever from the shaft which passes into the gearbox, by removing the nut and easing the lever from position with a screwdriver blade. Disconnect the lever from the cable. Remove the starter motor bracket from the gearbox and the motor and then unscrew the two nuts which clamp the starter motor housing to the back of the primary chaincase. The starter motor can now be withdrawn, leaving the starter secondary shaft in the primary chaincase.
9 On all models, the inner primary chaincase can now be detached. Remove the gearchange lever, if this has not already been accomplished, and detach the pivot bracket chrome cover which is retained by two screws. Disconnect the gearchange link rod at the operating arm by removing the small circlip. Carefully ease the operating arm/pivot shaft out towards the rear of the pivot bracket. In some cases removal of the chaincase inner front securing screw will be required, to give clearance for pivot shaft removal.
10 Loosen the five nuts which retain the gearbox on the baseplate. Remove the four bolts from the front portion of the chaincase; two of these are wire locked. Loosen and remove the four nuts which retain the chaincase to the gearbox. Using a length of wood passed through from the right-hand side of the machine, and a mallet, separate the chaincase from the gearbox. The casing is then free to be lifted away. The oil feed pipes to the rear of the casing should be disconnected. Note the 'O' ring which fits around the casing boss on the crankcase.

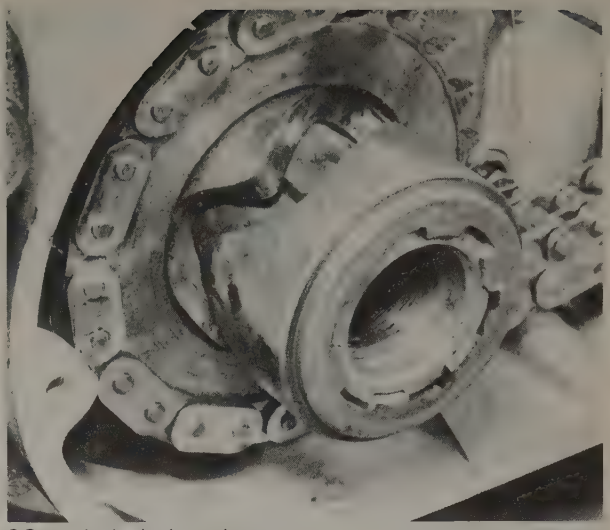


6.1 Primary chaincase is held by eight screws

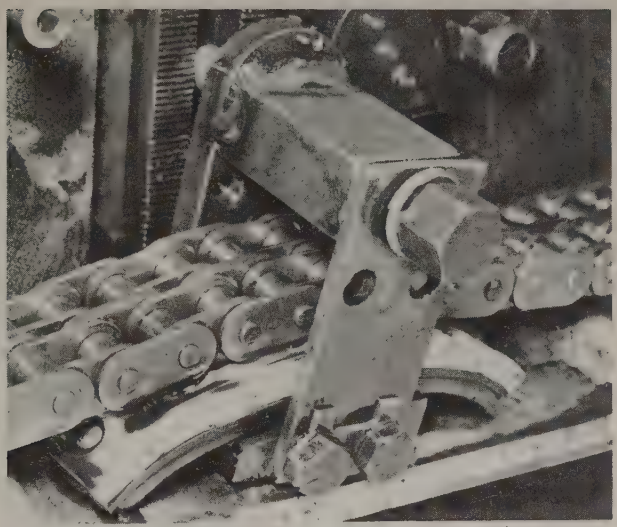
6.2a Place machine in gear to loosen engine sprocket nut



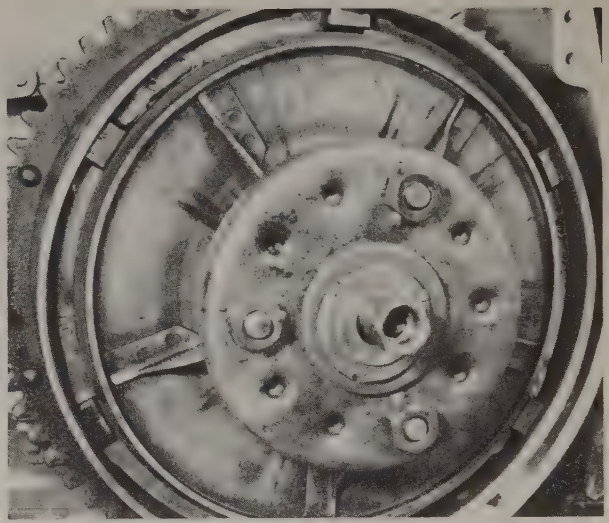
6.2b Remove the nut and cover followed by ...



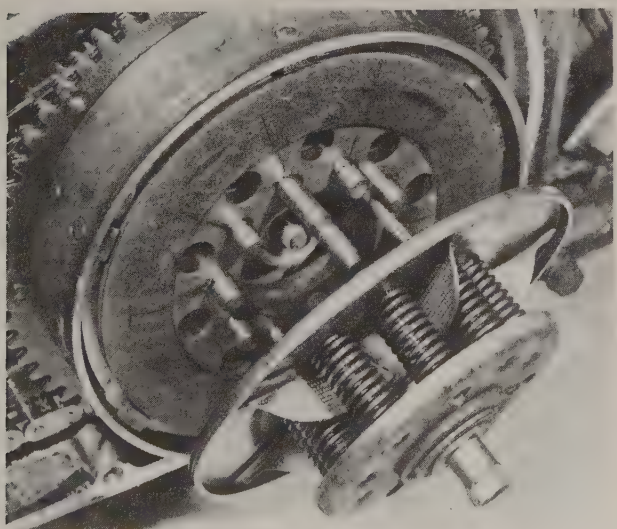
6.2c ... the locked cam boss



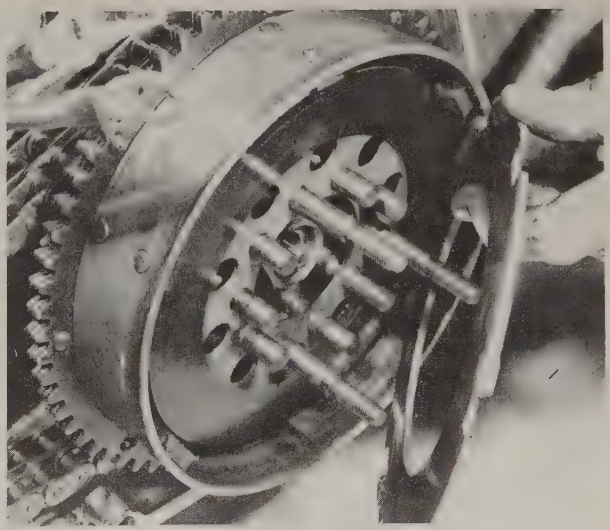
6.3 Unscrew centre bolt to free chain tension assembly



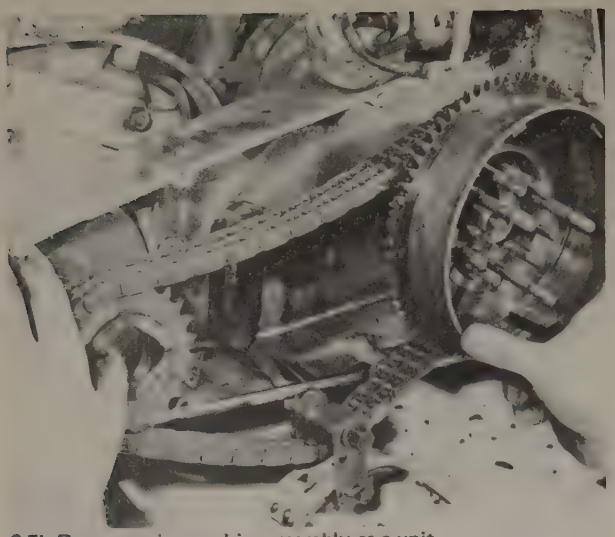
6.4a Use large washer and nut to compress springs



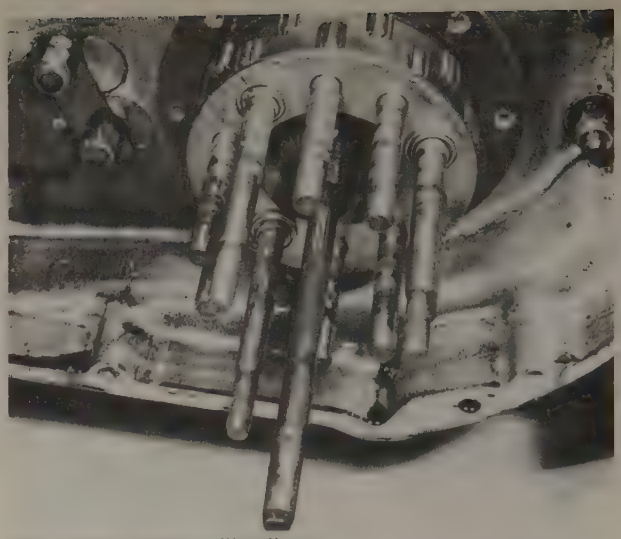
6.4b Remove nuts and lift off unit



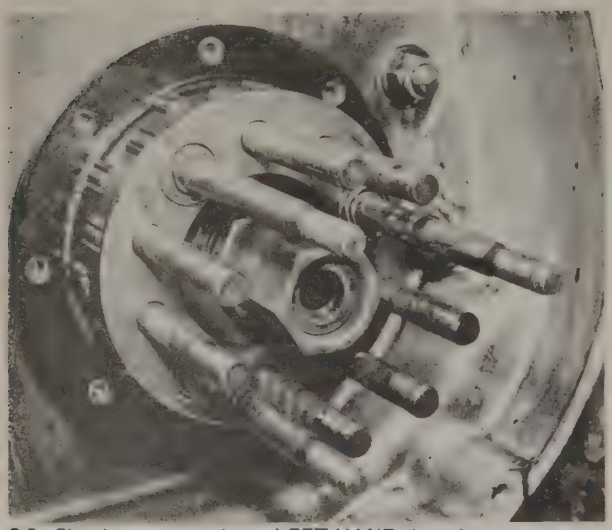
6.5a Lift out clutch plates, one at a time



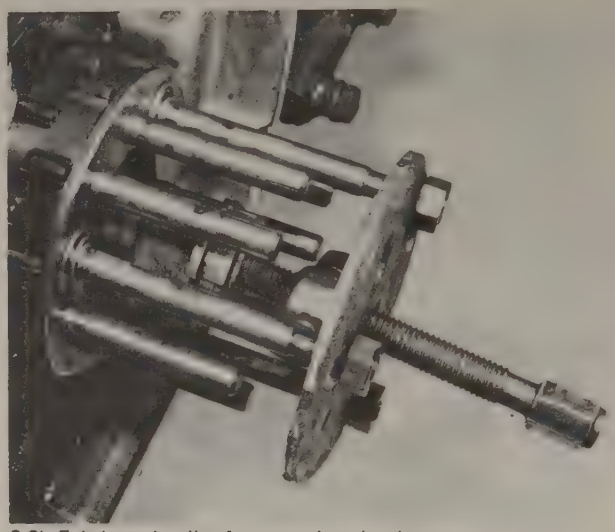
6.5b Remove primary drive assembly as a unit



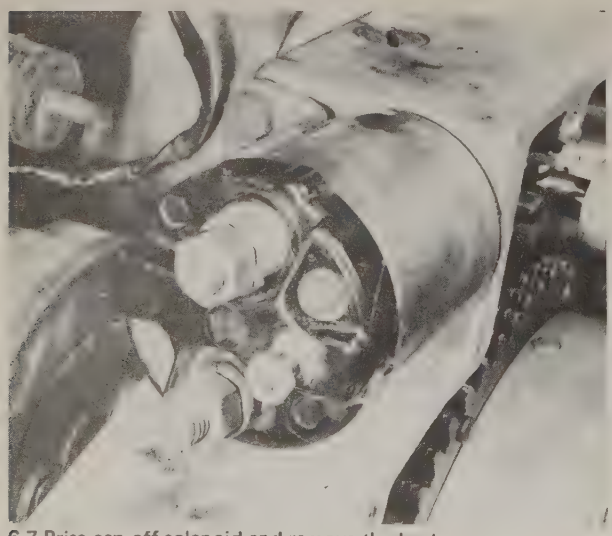
6.5c Clutch pushrod will pull out



6.6a Clutch centre nut has a LEFT-HAND thread



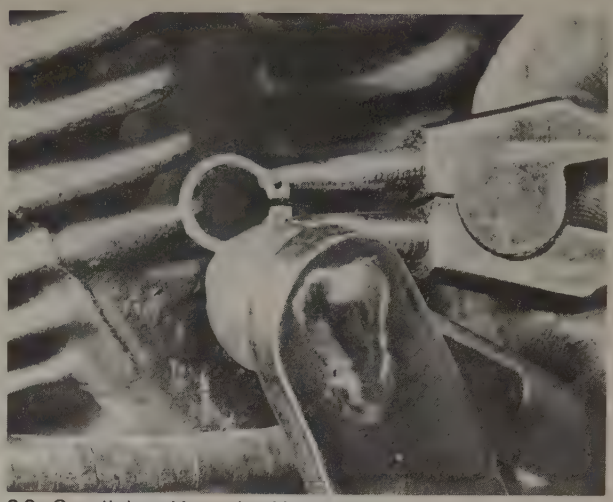
6.6b Fabricated puller for removing clutch centre



6.7 Prise cap off solenoid and remove the leads

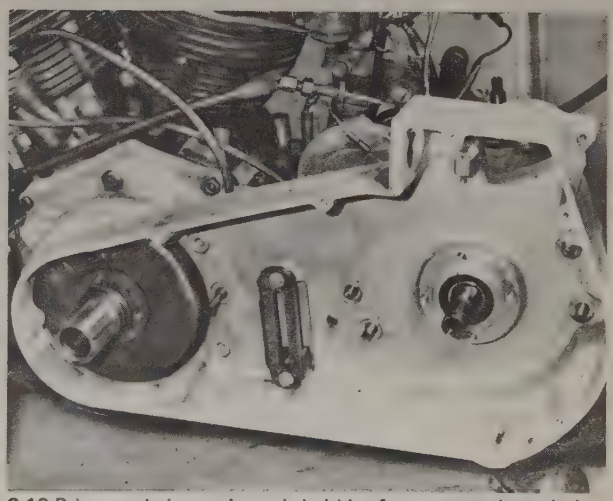
6.8a Disconnect clutch cable and remove the arm

6.8b Starter motor is held by two nuts



6.9a Gear link rod is retained by circlip

6.9b Slide pivot shaft out of support bracket



6.10 Primary chaincase inner is held by four nuts and two bolts

## 7 Removing the engine unit: final procedure

1 Detach the cylinder head steady by removing the horizontal bolt and the two cylinder head nuts and washers. On models where the bracket also retains the ignition switch, tape the unit to the upper frame tube, so that disconnection of the wiring leads is rendered unnecessary.

2 The wiring leads from the rectifier-regulator are connected with the alternator by means of a socket which is a push fit in the front left-hand of the crankcase. Carefully ease the socket from position. Removal of the rectifier-regulator is not strictly necessary, but as it is in close proximity with the engine, it may become accidentally damaged. The unit is retained by four nuts and bolts.

3 Detach the speedometer drive cable from the cable clip attached to the crankcase bolt at the base of the two cylinders.

4 The engine is retained by four bolts, two of which are fitted at the rear of the engine and two at the front. Remove all four nuts and gently tap the bolts from place. The engine is now ready for removal. Check that all electrical leads and controls have been disconnected and are out of harms way. As mentioned in Section 4, the engine is particularly heavy, and due to the close proximity of cycle parts, difficult to manoeuvre from position. As can be seen from the photographs, an engine lift was used to remove the engine. This is not absolutely necessary, although it will aid matters. Three or more stout fellows will make an admirable substitute. A long bar or wooden pole of suitable strength, lashed across the top of the cylinder heads will give a firm grip for lifting. The engine should be removed from the right-hand side of the machine.

## 8 Dismantling the engine unit: general

1 Before commencing work on the engine unit, the external surfaces should be cleaned thoroughly. A motorcycle engine has very little protection from road grit and other foreign matter which sooner or later will find its way into the dismantled engine if this simple precaution is not fulfilled.

2 One of the proprietary cleaning compounds such as Gunk or Jizer can be used to good effect, especially if the compound is first allowed to penetrate the film of grease and oil before it is washed away. When washing down make sure that the water cannot enter the carburettors or the electrical system, particularly now that these parts are more exposed.

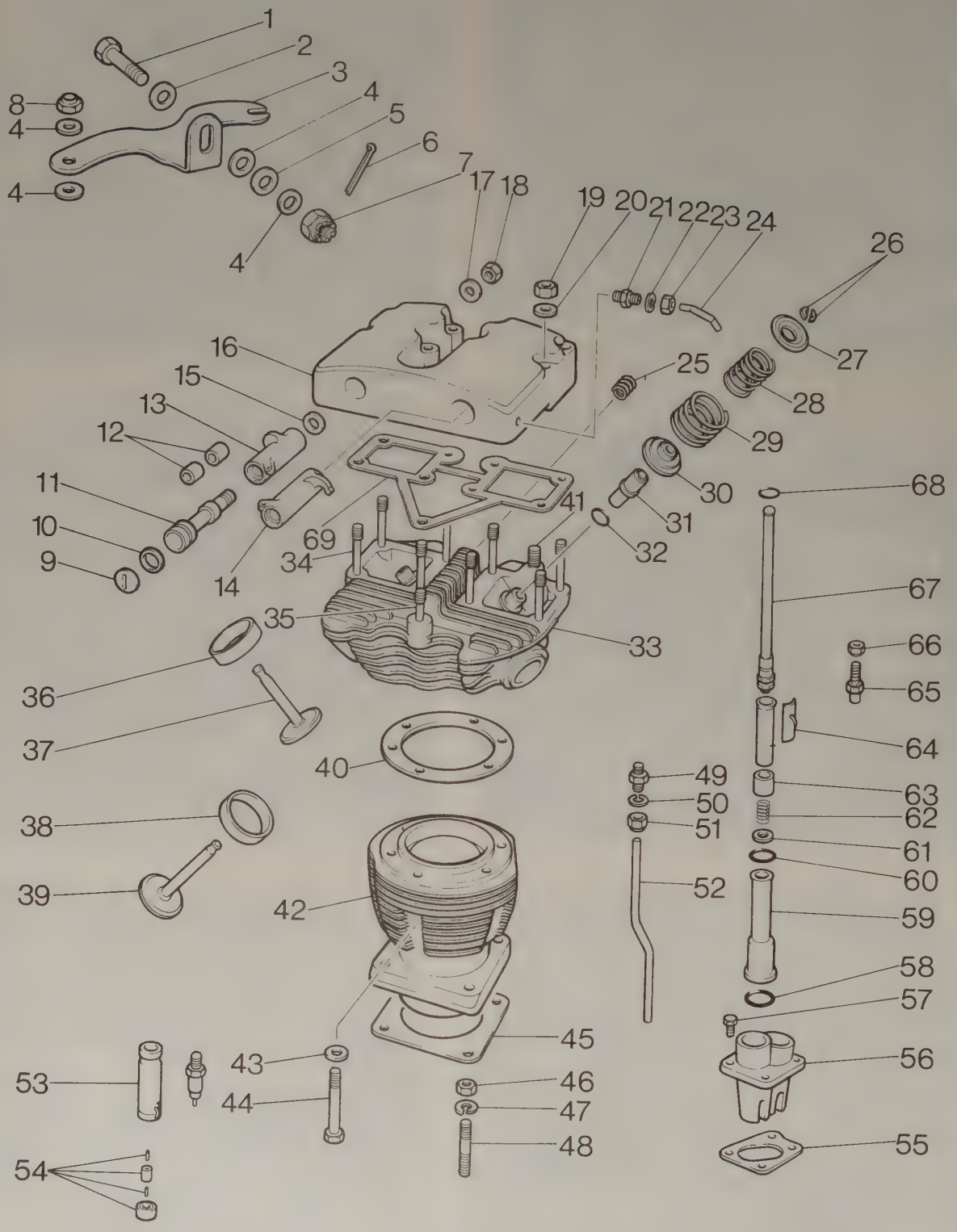
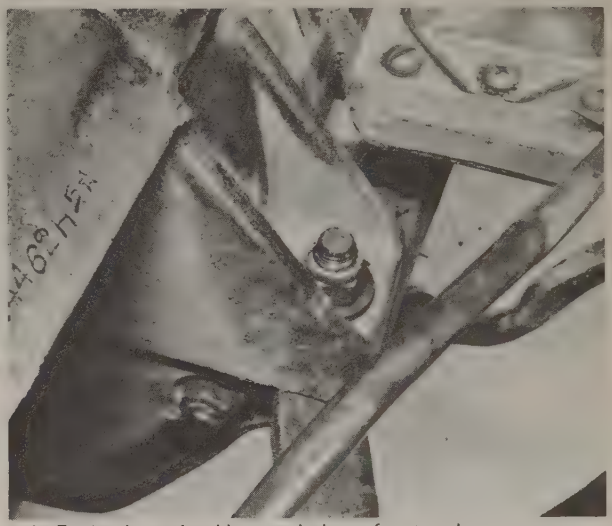


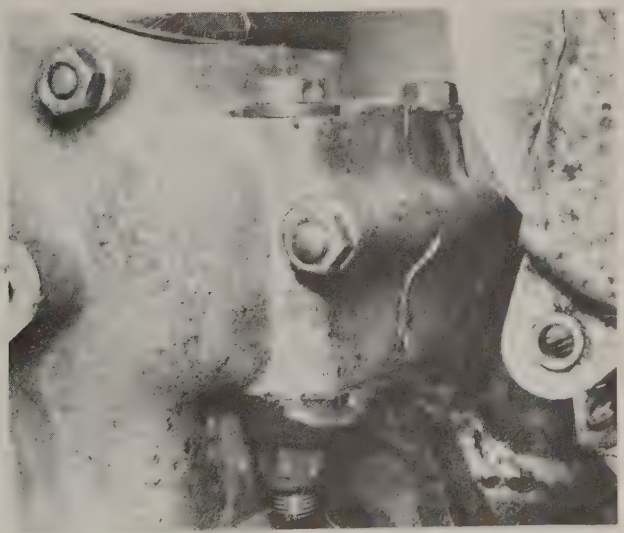

Fig. 1.1. Cylinder head, barrel and rocker box

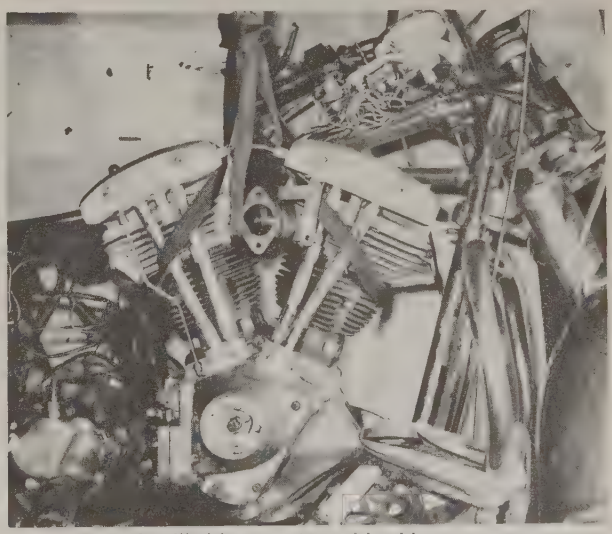
**Fig. 1.1. Cylinder head, barrel and rocker box**

1 Head steady bolt
2 Washer
3 Head steady bracket
4 Washer - 4 off
5 Washer
6 Split pin
7 Castellated nut
8 Nut - 4 off
9 End cap - 4 off
10 'O' ring - 4 off
11 Rocker spindle - 4 off
12 Bush - 8 off
13 Inlet rocker arm - 2 off
14 Exhaust rocker arm - 2 off
15 Spacer - 4 off
16 Rocker box - 2 off
17 Sealing washer - 4 off
18 Domed nut - 4 off
19 Nut - 18 off
20 Plain washer - 18 off
21 Union - 2 off
22 Sleeve - 2 off
23 Union nut - 2 off
24 Cross-over pipe
25 Spark plug helicoil insert - 2 off
26 Collet set - 4 off
27 Valve collar - 4 off
28 Inner spring - 4 off
29 Outer spring - 4 off
30 Spring seat - 4 off
31 Valve guide - 4 off
32 'O' ring - 4 off
33 Cylinder head - 2 off
34 Stud - 16 off
35 Stud - 2 off
36 Exhaust valve seat - 2 off
37 Exhaust valve - 2 off
38 Inlet valve seat - 2 off
39 Inlet valve - 2 off
40 Head gasket - 2 off
41 Stud - 4 off
42 Cylinder barrel - 2 off
43 Plain washer - 10 off
44 Bolt - 10 off
45 Cylinder base gasket - 2 off
46 Nut - 8 off
47 Spring washer - 8 off
48 Stud - 8 off
49 Union
50 Sleeve
51 Union nut
52 Oil feed pipe
53 Cam follower - 4 off
54 Follower roller foot - 4 off
55 Gasket - 2 off
56 Guide block - 2 off
57 Bolt - 8 off
58 Cork seal - 4 off
59 Pushrod tube - 4 off
60 Cork seal - 4 off
61 Plain washer - 4 off
62 Spring - 4 off
63 Spring cover - 4 off
64 Keeper plate - 4 off
65 Pushrod adjuster - 4 off
66 Locknut - 4 off
67 Pushrod - 4 off
68 Cork washer - 4 off
69 Cylinder head gakset - 2 off

7.2 Disconnect rectifier-regulator at rubber plug


7.4a Engine is retained by two bolts at front and ...


7.4b ... two similar bolts at the rear


7.4c Engine lift will aid removal considerably

3 Collect together a good set of tools including a set of AF spanners and a screwdriver with a crosshead bit of the correct size. If the engine has not been dismantled previously, it is advisable to either purchase or borrow an impact screwdriver. This will avoid damaging the heads of the crosshead screws, used for engine assembly, most of which will be very tight. If an impact screwdriver is not available, it is often possible to use a crosshead screwdriver fitted with a 'T' handle as a substitute. Work on a clean surface and have a supply of clean, lint-free rag available.
4 Never use force to remove any stubborn part unless specific mention is made of this requirement in the text. There is invariably good reason why a part is difficult to remove, often because the dismantling operation has been tackled in the wrong sequence.
5 Dismantling will be made easier if a simple engine stand is constructed that will correspond with the engine mounting points. This arrangement will permit the complete unit to be clamped rigidly to the workbench, leaving both hands free for the dismantling operation.

## 9 Dismantling the engine unit: removing the cylinder heads and barrels

1 Commence operations by removing the induction manifold. It is secured by two clamps, each of which is fastened by a crosshead screw. Slacken each screw and pull the induction manifold from position.
2 Remove the rocker boxes. Commence by unscrewing the oil feed unions and removing the small diameter oil feed pipe, which is easily damaged. Each rocker box is retained by nine bolts, which should be slackened an equal amount, in sequence. It is preferable to ensure the valves of the cylinder involved are closed, to avoid placing stress on the casting from an open valve. Mark the rocker boxes so that they cannot be interchanged and lift them out. The pushrods can then be lifted out of their tubes and each clearly marked to ensure they are eventually replaced in their original position. The pushrod tubes can then be lifted off, each as a complete assembly.
3 Each cylinder head is retained by five bolts, which will be tight. Make sure the spanner used has the right fit and there is plenty of leverage. If the cylinder head is not free after the bolts have been withdrawn, tap it lightly with a rawhide mallet, in an attempt to break the joint. Never attempt to prise it off, or broken fins will result. There is no point in marking the cylinder head as the front and rear assemblies have a different layout and cannot be interchanged.
4 Each cylinder barrel is retained by four nuts around the base flange. When these nuts are removed, the cylinder barrel can be lifted from position. Take care to catch the piston as it emerges from the bore as if it is allowed to fall free either the piston itself or the piston rings may be damaged. If only a top overhaul is contemplated, pad the mouth of the crankcase with clean rag as each barrel is raised. This will prevent particles of broken piston ring or other foreign matter from dropping into the crankcase as each piston emerges from its bore. It would otherwise be necessary to strip the engine completely in order to retrieve the broken parts.
5 Remove one gudgeon pin circlip from each piston. The circlips are a double spiral type which can be removed most easily using two sharp-pointed tools. Press each gudgeon pin out of position. If the gudgeon pins are a tight fit, they can be freed by warming the piston crown to expand the metal. A convenient method of accomplishing this is to place a clean rag in boiling water, wring it out, and apply it to the piston crown. Mark each piston inside the skirt, to ensure it is replaced the correct way round and in the cylinder with which it was associated, during reassembly.

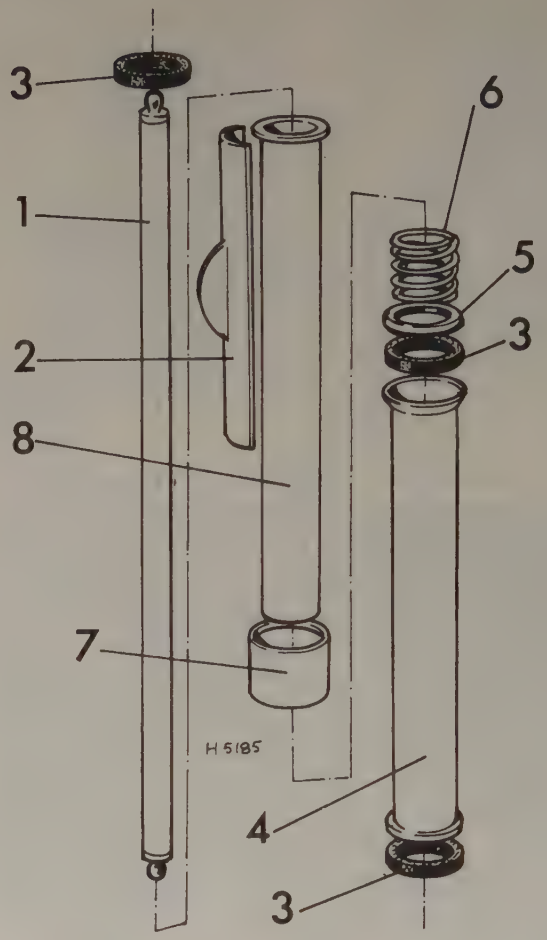
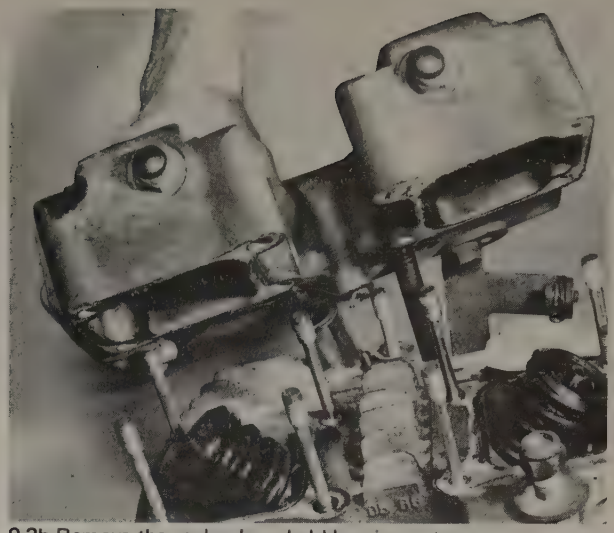



**Fig. 1.2. Pushrod cover assembly**

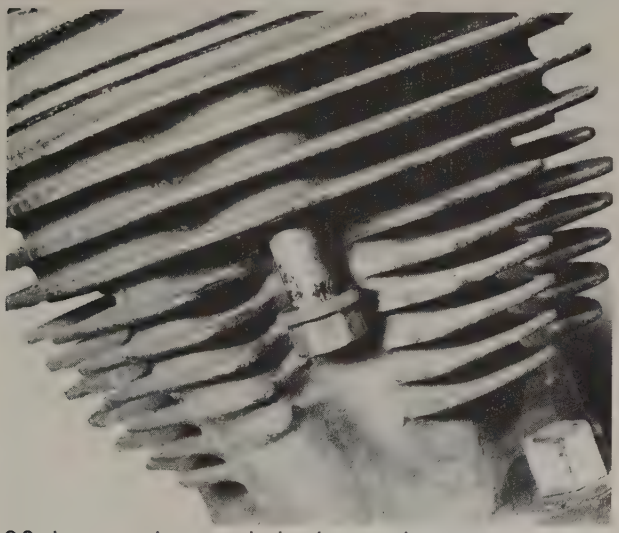
*1 Pushrod - 4 off*
*2 Cover spring keeper - 4 off*
*3 Cork sealing washer - 8 off*
*4 Lower cover - 4 off*
*5 Seal - 4 off*
*6 Spring - 4 off*
*7 Spring retainer - 4 off*
*8 Upper cover - 4 off*

9.1 Unscrew two clamps and pull off induction manifold

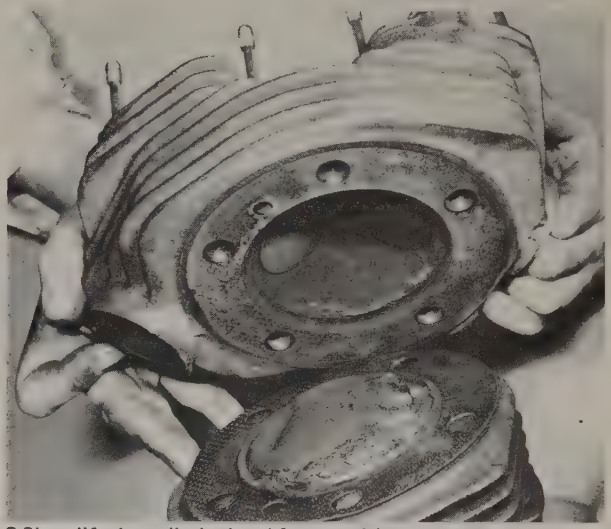
9.2a Detach the rocker oil feed cross-over pipe



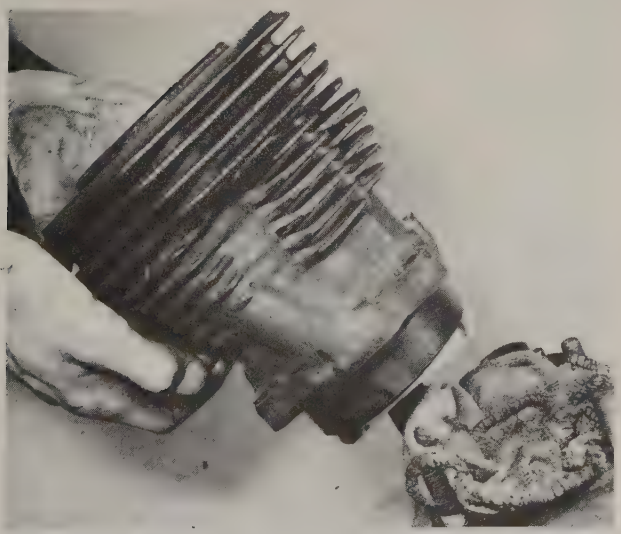
9.2b Remove the rocker box; held by nine nuts



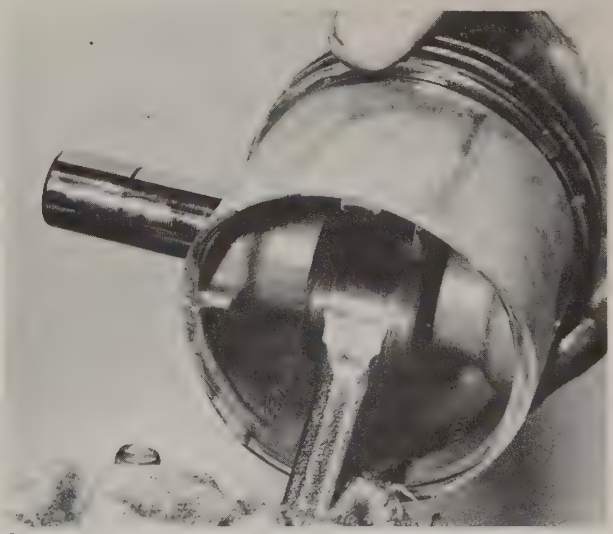
9.3a Loosen and remove the head nuts and ...



9.3b ... lift the cylinder head from position



9.4 Pad crankcase mouth before removing the barrel



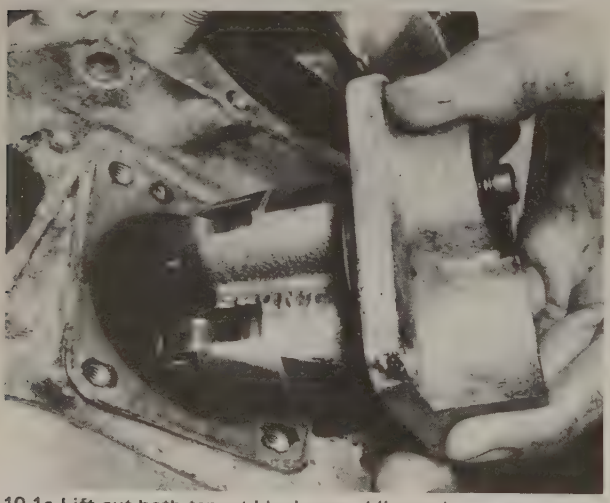
9.5 Remove circlip and push out gudgeon pin

**10 Dismantling the engine unit: removing the tappets and tappet blocks**

1 The hydraulic tappets and the cam followers are fitted in pairs into two separate tappet blocks, secured in the top of the timing chest by four countersunk bolts each. After removal of the bolts, the blocks complete with the followers can be lifted out. If necessary, use a rawhide mallet to loosen each block on the gasket.
2 Care should be taken that the tappets and followers do not drop from position as the blocks are lifted clear. To prevent this, pinch the two tappet heads together during removal. If the followers or tappets are removed from the blocks or separated from one another, they should be marked to ensure that they are replaced in their original positions.

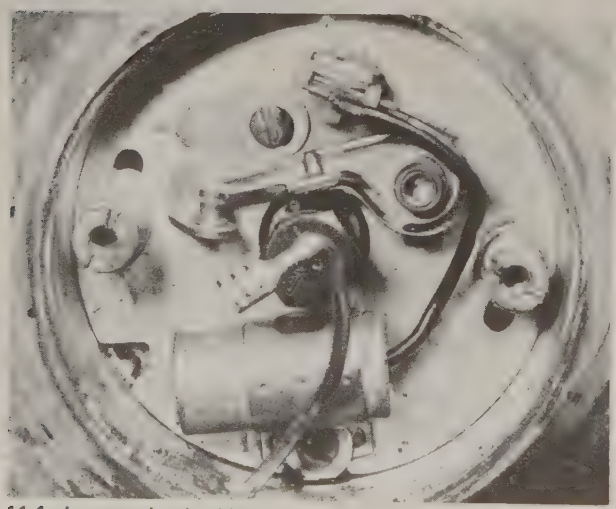
**11 Dismantling the engine unit: removing the timing chest and timing pinions**

1 Remove the cover plate from the centre of the timing chest cover, to gain access to the contact breaker assembly. The contact breaker baseplate is retained by the two screws provided for ignition timing adjustment. Before removing the screws and lifting the backplate away, complete with the contact breaker assembly, mark the relative position of the backplate and the timing chest casting, using a centre punch. This will aid replacement of the plate in the correct position. The low tension lead to the contact breaker assembly is secured at the base of the timing chest by a clip retained by one of the casing screws.
2 After removal of the contact breaker baseplate, unscrew the automatic advance unit centre screw and lift this unit away, complete with the contact breaker cam. The timing chest cover is retained by six crosshead screws. Loosen and remove the screws in an even and diagonal sequence. The cover is now free for removal. If necessary, use a rawhide mallet to separate the cover from the gasket joint. Remove and discard the gasket.
3 Withdraw the camshaft from the timing chest, followed by the timed breather. Lock the crankshaft by placing a close fitting rod through one connecting rod small end eye, and allowing it to bear down on two blocks of wood placed across the crankcase mouth. Unscrew the special nut which secures the timing pinion on the crankshaft. This nut has two flats only milled on it and should be loosened with an open ended spanner. The timing pinion is a light drive fit on the crankshaft and is located by a Woodruff key. A small two legged sprocket puller should be used to draw the pinion off the shaft. When the pinion has been withdrawn, remove the Woodruff key from the shaft, followed by the spacer collar and oil pump drive pinion. The oil pump pinion is also located by a Woodruff key, which should be removed.

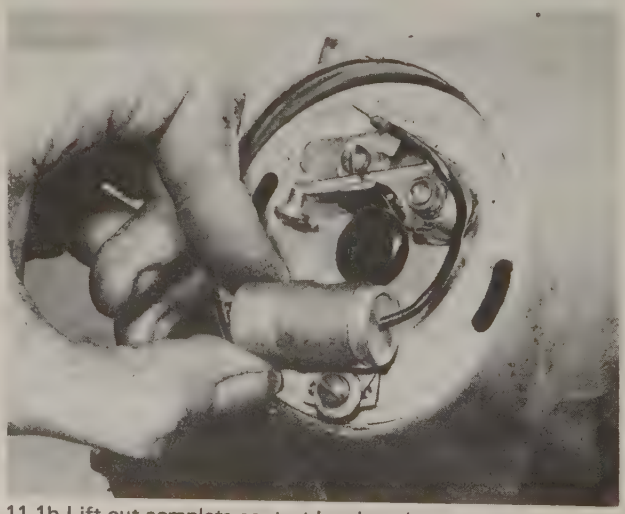


10.1a Lift out both tappet block assemblies each ...

10.1b ... held by four countersunk headed bolts

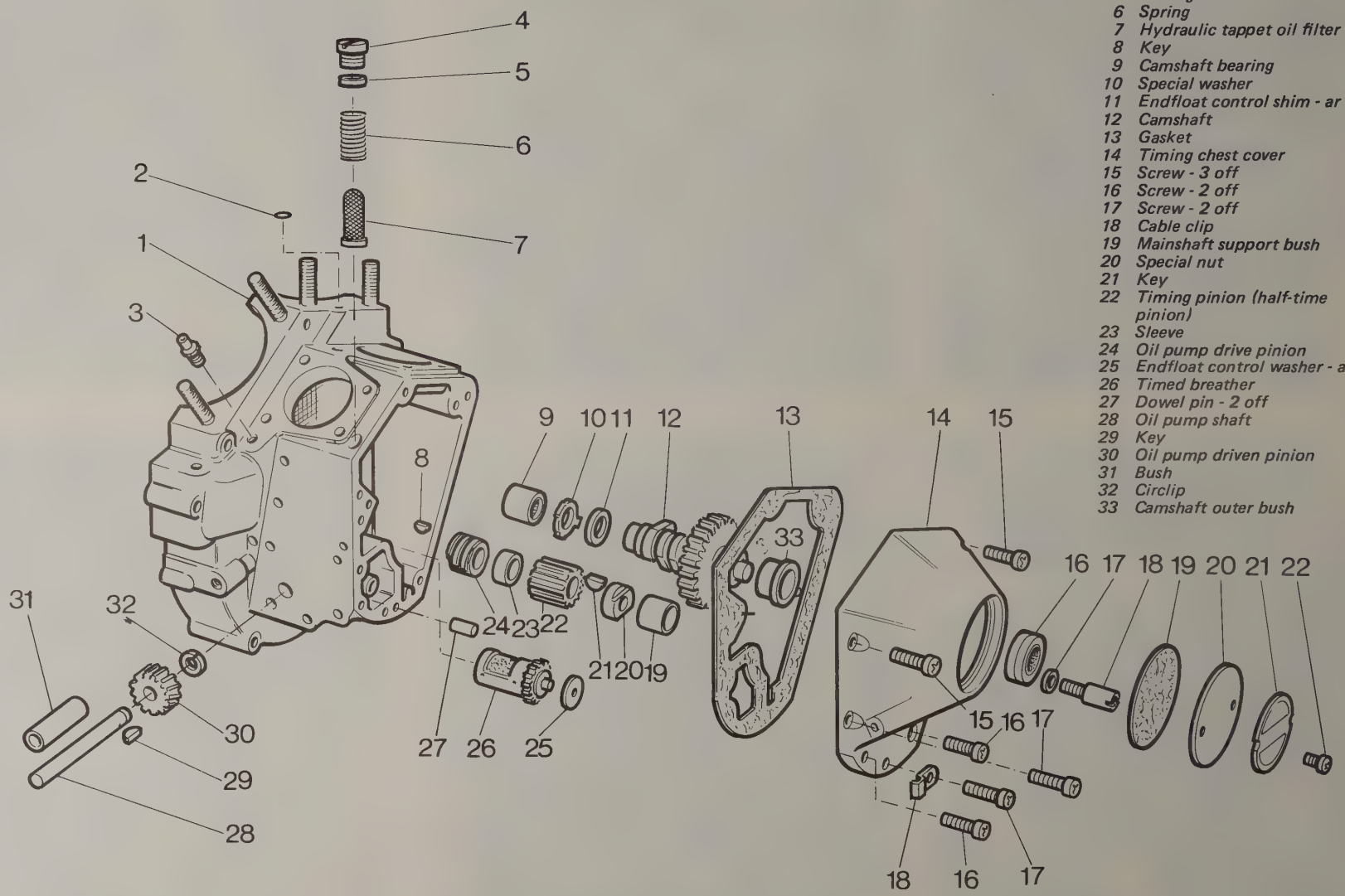


11.1a Low tension lead is push fit on terminal

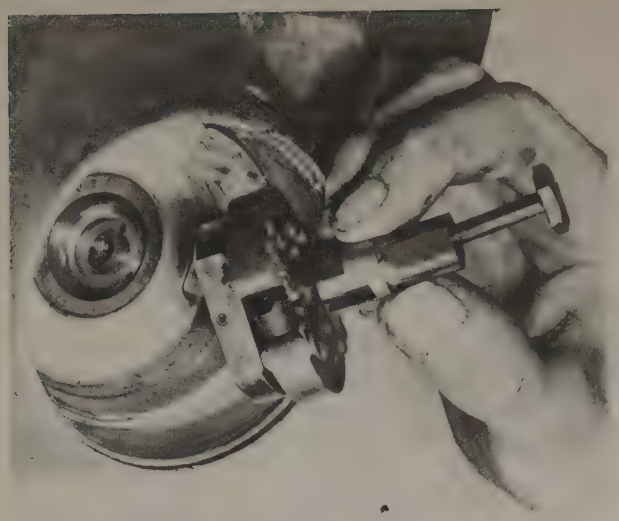


11.1b Lift out complete contact breaker plate assembly

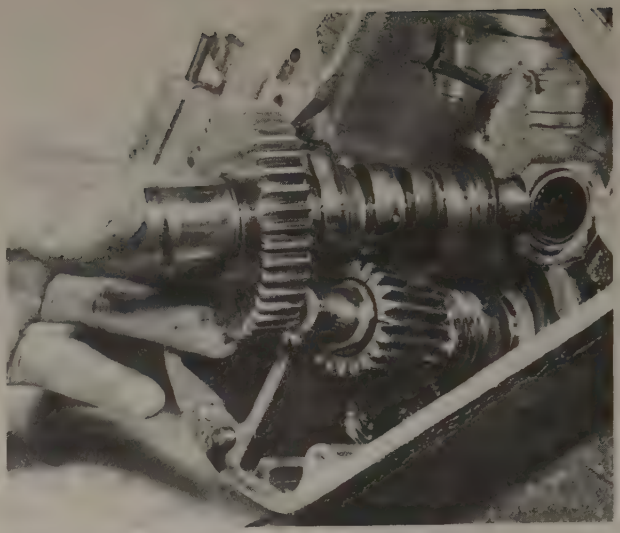
**Fig. 1.3. Timing chest and cover - component parts**



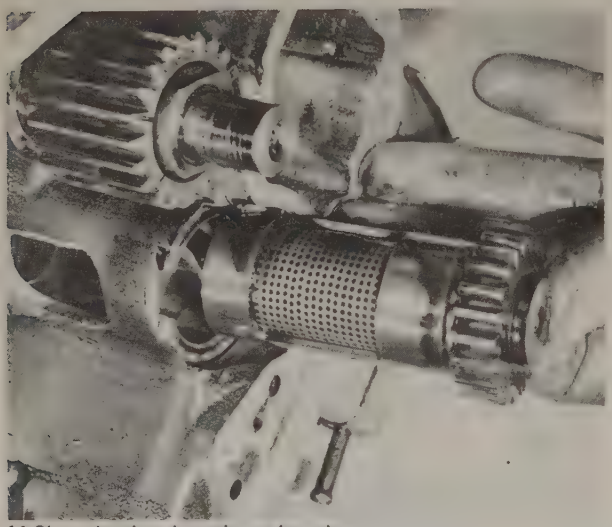

1 *RH crankcase half*
2 *Rubber plug*
3 *Rocker oil feed union*
4 *Plug*
5 *Sealing washer*
6 *Spring*
7 *Hydraulic tappet oil filter*
8 *Key*
9 *Camshaft bearing*
10 *Special washer*
11 *Endfloat control shim - ar*
12 *Camshaft*
13 *Gasket*
14 *Timing chest cover*
15 *Screw - 3 off*
16 *Screw - 2 off*
17 *Screw - 2 off*
18 *Cable clip*
19 *Mainshaft support bush*
20 *Special nut*
21 *Key*
22 *Timing pinion (half-time pinion)*
23 *Sleeve*
24 *Oil pump drive pinion*
25 *Endfloat control washer - ar*
26 *Timed breather*
27 *Dowel pin - 2 off*
28 *Oil pump shaft*
29 *Key*
30 *Oil pump driven pinion*
31 *Bush*
32 *Circlip*
33 *Camshaft outer bush*



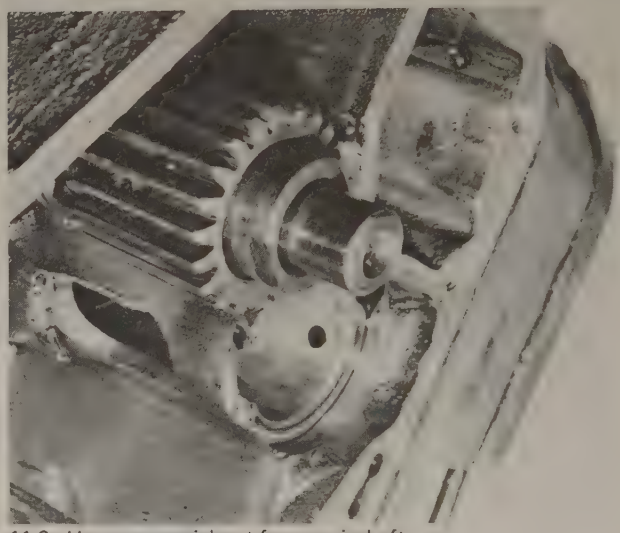
11.2 ATU is held by a central bolt



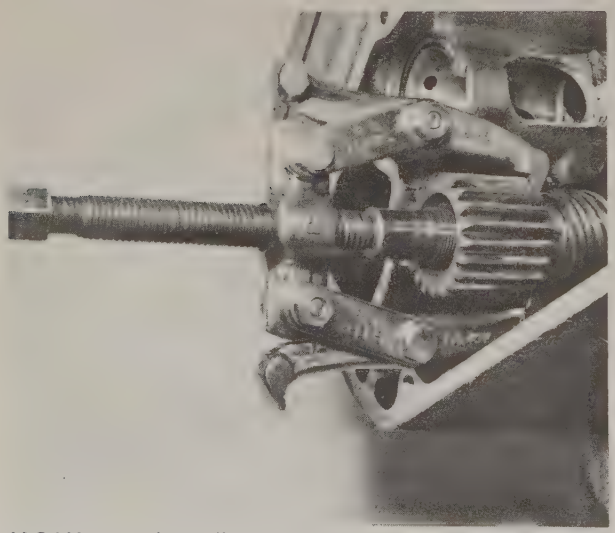
11.3a Withdraw the camshaft followed by ...



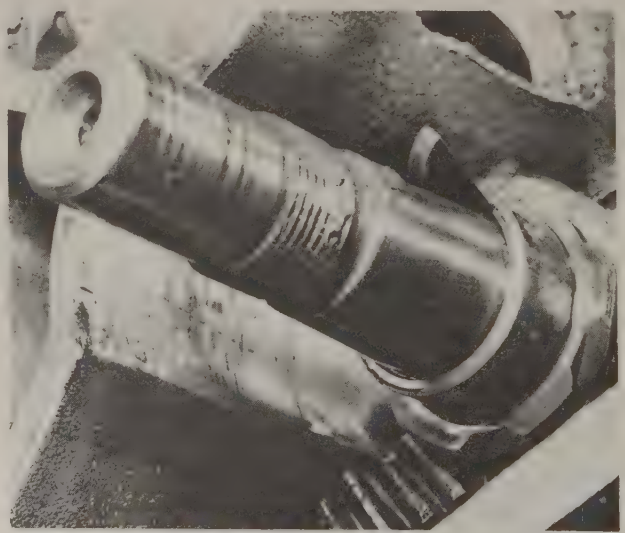
11.3b ... the timed crankcase breather



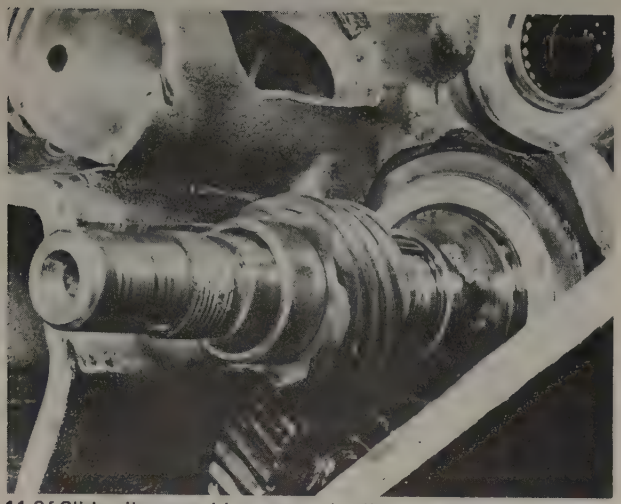
11.3c Unscrew special nut from mainshaft

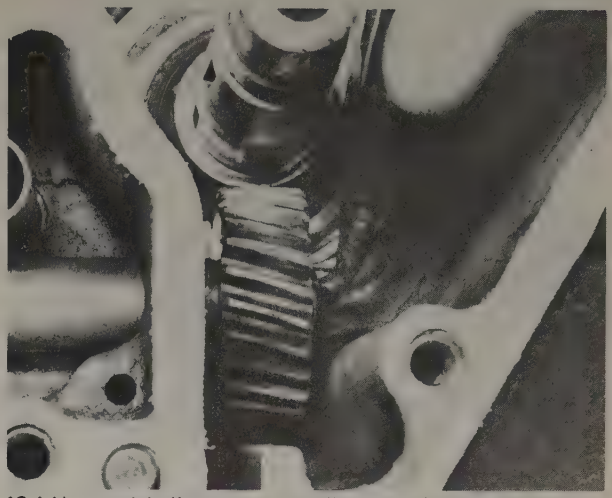


11.3d Use sprocket puller to withdraw timing pinion



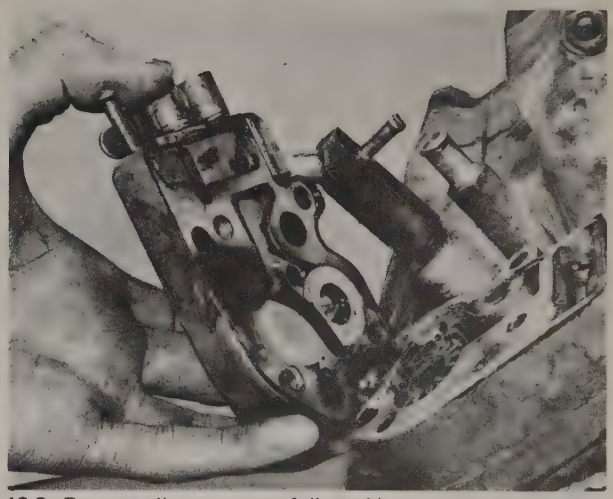
11.3e Prise out Woodruff key and store safely


11.3f Slide oil pump drive gear and collar off shaft


12.1 Use special pliers to remove oil pump driven gear circlip

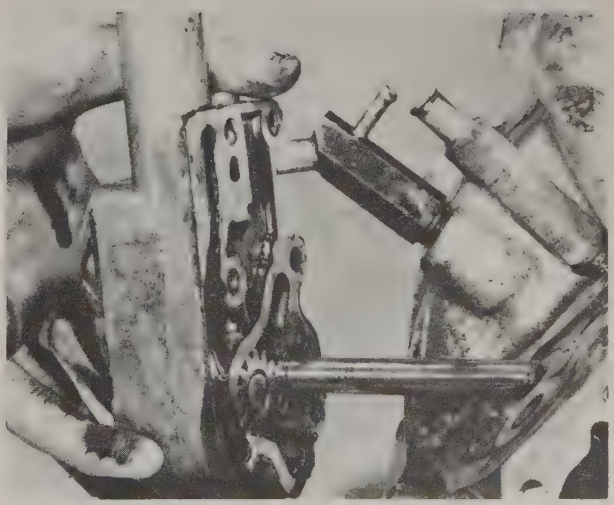
## 12 Dismantling the engine unit: removing the oil pump

1 The oil pump drive spindle is located on the driveshaft by a Woodruff key and is secured by a small circlip. Removal of the circlip requires care and a steady hand as access is obscured by the timing chest wall. If possible, use a pair of external opening circlip pliers with 90° cranked jaws. If this type of tool is not available it is possible to spring the clip from position with a small screwdriver blade. Take care not to lose the clip as it leaves the shaft.
2 Remove the four bolts which pass through the pump body and the two nuts and washers which secure the upper portion of the pump. Pull the complete oil pump away from the timing chest, bringing with it the pump drive spindle. The oil pump drive gear and Woodruff key will fall free into the timing chest. The oil pump outer cover will probably slip from place when the four mounting bolts are removed. Ensure when this happens, and also as the main body of the pump is removed, that the pump gears do not fall from place. It is important that the gears are always retained or refitted in their original positions.
3 Unscrew the large recessed screw in the rear top of the timing chest and lift out the tappet feed oil filter cone and backing spring.


12.2a Remove oil pump cover followed by ...

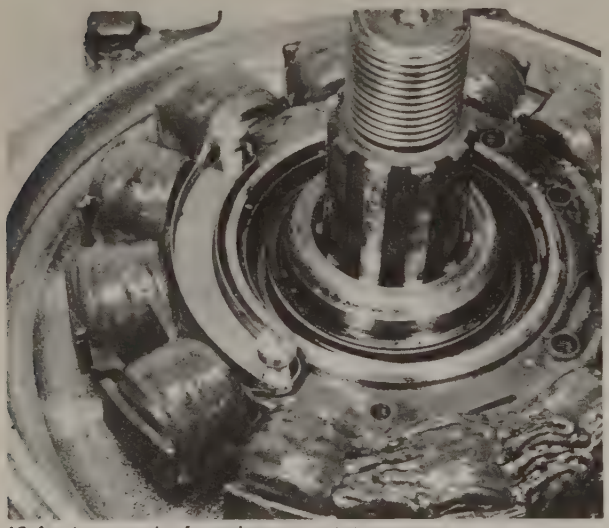
## 13 Dismantling the engine unit: removing the alternator

1 Support the engine on blocks so that the alternator is facing upwards, away from the workbench. Using a number of tyre levers, prise the engine sprocket splined sleeve off the splined crankshaft.
2 The alternator rotor is fitted with an internally splined boss which engages with the splined crankshaft, and upon which it is a press fit. The alternator rotor will therefore require drawing from position, using a simple fabricated puller comprised of a circular plate drilled to take three bolts of equal size which screw into the threaded holes in the alternator rotor boss. Fit the plate over the crankshaft end and tighten the bolts down evenly to draw the rotor from position.
3 Knock down the ears of the lock plates which secure the four stator mounting screws and remove them. Detach the bridge piece which secures the alternator leads, and which is retained by two countersunk screws. The rubber plug which forms the ends of the leads is a tight push fit in the crankcase. Select a number of blunt ended tools with which to push the plug from position, towards the alternator. Do not use any sharp instruments as they may pierce the plug and damage the wiring or plug pins. The alternator stator can be lifted away.

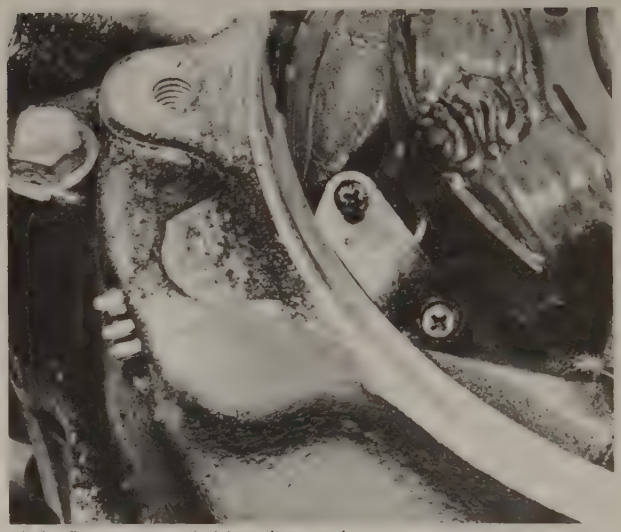

12.2b ... the oil pump body complete with gears and driveshaft

13.1 Use tyre lever to remove engine sprocket sleeve

13.3 Fabricate puller to draw rotor off shaft

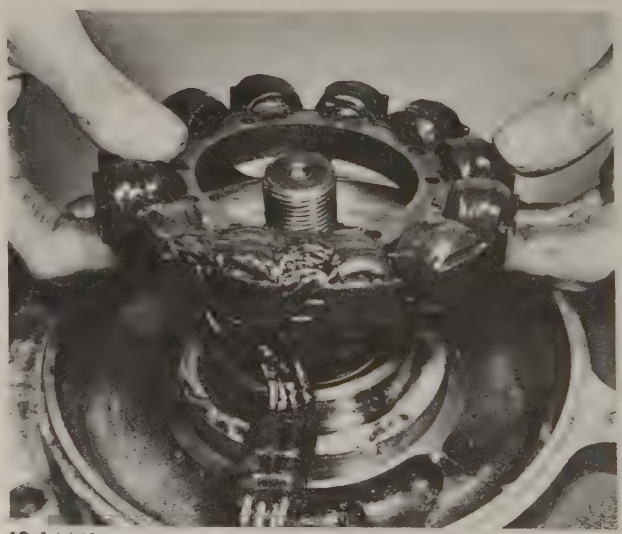


13.4a Unscrew the four alternator stator screws



13.4b Remove lead bridge piece and ...

13.4c VERY CAREFULLY push socket out of crankcase



13.4d Lift stator assembly from position

### 14 Dismantling the engine unit: separating the crankcase halves

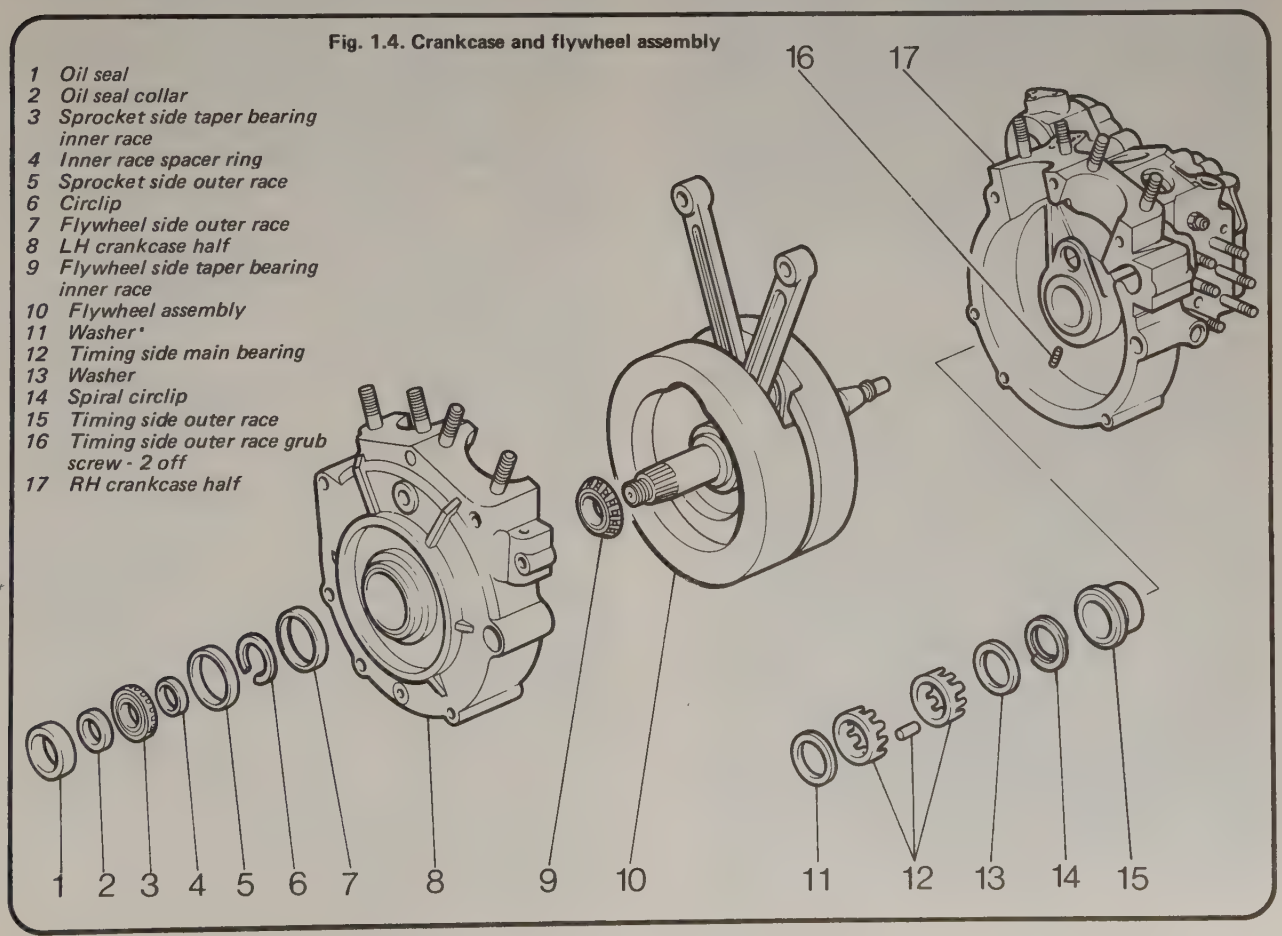
1 Before the crankcase halves are separated, the flywheel assembly endfloat should be ascertained. If the endfloat is greater than the specified maximum but it is found that the drive side main bearings are in good condition, spacers may be fitted on reassembly. Measure the endfloat by fixing a dial gauge to the timing chest so that the dial gauge plunger is in contact with the end of the crankshaft. Using the engine sprocket nut screwed onto the drive side crankshaft, pull the whole crankshaft as far to the drive side as possible. Zero the dial gauge and then push the crankshaft fully over to the timing side. The total endfloat should not be greater than 0.006 in (0.152 mm). Greater endfloat will probably indicate the need for new drive side main bearings.
2 Remove the nuts and washers from one end of each of the six crankcase studs and then unscrew the two crankcase bolts. Using a suitable drift, gently tap out the six studs. With a rawhide mallet, tap the right-hand crankcase away from the left-hand crankcase half until the joint is broken. Do not try and prise the two casings apart by placing screwdriver blades or other levers between the mating surfaces. This will almost certainly damage the surfaces and promote subsequent oil leakage. After the joint has been broken, lift the right-hand crankcase half off the timing side main bearing.
3 The drive side crankshaft is a heavy press fit in the two tapered main bearings and the oil seal collar. Because of this, the flywheel assembly must be pressed out of the crankcase half leaving the oil seal, oil seal collar and outer tapered main bearing in the crankcase and the inner tapered roller bearing inner race on the crankshaft. Removal of the flywheel assembly requires the use of a fly press, which will enable a controlled amount of pressure to be applied to the crankshaft end. Many garages and motorcycle repair specialists use this type of press and will carry out the operation for a nominal sum.
4 After flywheel assembly removal, apply a large drift to the inner race of the outer tapered bearing and drift the bearing, oil seal collar and oil seal out from the inside of the crankcase half. A length of tubing with an outside diameter similar to that of the bearing inner race will make a suitable drift.

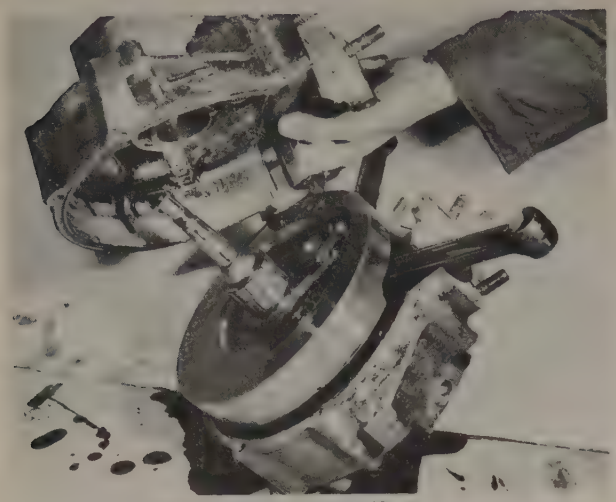
### 15 Examination and renovation: general

1 Before examining the parts of the dismantled engine for wear, it is essential that they should first be cleaned thoroughly. Use a petrol/paraffin mix to remove all traces of old oil and sludge that may have accumulated within the engine.
2 Examine the various castings for cracks or other signs of damage, especially the crankcase castings. If a crack is discovered, it will require professional repair, or replacement.
3 Examine carefully each part to determine the extent of wear, checking with the tolerance figures listed in the Specifications Section of this Chapter. If there is any question of doubt, play safe and renew. Notes included in the following text will indicate what type of wear can be expected and whether the part concerned can be reclaimed.
4 Use a clean, lint-free rag for cleaning and drying the various components. This will obviate the risk of small particles obstructing the internal oilways, causing the lubrication system to fail.
5 Above all, work in clean, well-lit surroundings so that faults do not pass undetected. Failure to detect a fault or signs of advanced wear may necessitate a further complete strip down at a later date, due to the premature failure of the part concerned.

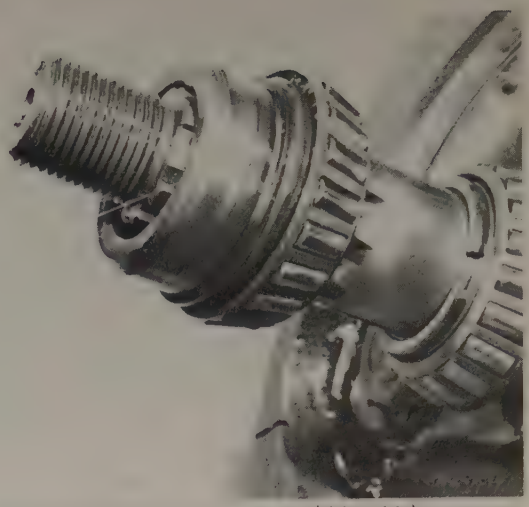
**Fig. 1.4. Crankcase and flywheel assembly**

1 *Oil seal*
2 *Oil seal collar*
3 *Sprocket side taper bearing inner race*
4 *Inner race spacer ring*
5 *Sprocket side outer race*
6 *Circlip*
7 *Flywheel side outer race*
8 *LH crankcase half*
9 *Flywheel side taper bearing inner race*
10 *Flywheel assembly*
11 *Washer*
12 *Timing side main bearing*
13 *Washer*
14 *Spiral circlip*
15 *Timing side outer race*
16 *Timing side outer race grub screw - 2 off*
17 *RH crankcase half*





14.2a Remove timing side crankcase half



14.2b Main bearing assembly components (drive side)

**16 Big-end and main bearings: examination and renovation**

1 The crankshaft assembly takes the form of a pair of heavy flywheels joined together by a single crankpin and big-end assembly, which serves both cylinders. An ingenious arrangement of overlapping permits the two connecting rods to share the common big-end assembly without fouling each other during rotation, i.e. the front connecting rod fits within the forked rear rod.

2 It is not possible to separate the flywheel assembly without access to the appropriate press equipment or to realign the dismantled assembly to a sufficiently high standard of accuracy without the use of a lathe. In consequence, it is imperative that the complete flywheel assembly is entrusted to a Harley-Davidson specialist for repairs of any kind, who will have either the necessary repair facilities or a service exchange replacement.

3 Failure of the big-end bearing is invariably accompanied by a pronounced knock from within the crankcase, which progressively gets worse. Vibration will also be experienced. Strictly speaking each big-end bearing should have radial play of 0.0005 - 0.001 in (0.012 - 0.025 mm). This measurement is very difficult to make accurately, even using a dial gauge. Certainly, if perceptible play is evident, it is probable that the big-end bearings require renewal. Testing for play should be carried out only after all the oil has been washed out of the bearings. If there is any doubt as to the condition of the bearings, advice of a Harley-Davidson specialist should be sought. Do not run the machine with worn big-end bearings, otherwise there is risk of causing extensive damage by breakage of either of the connecting rods or the crankpin.

4 Do not confuse the big-end wear with side play in the bearing, a small amount of which is acceptable. This should be maintained within the limits of 0.005 in - 0.025 in (0.127 - 0.625 mm). The clearance should be checked with a feeler gauge.

5 Worn main bearings can be detected by an audible rumble from the lower end of the engine and vibration that is particularly noticeable through the footrests. Wear of the drive side tapered roller bearings can be ascertained by measuring the flywheel assembly endfloat as described in paragraph 1 of the previous Section. The timing side main bearings consist of two caged needle roller bearings placed side by side. A radial play of 0.0005 - 0.001 in (0.012 - 0.025 mm) is correct, but in common with the big-end bearings, the exact amount is difficult to measure. If any perceptible play is evident, the bearings will require renewal.

6 Whilst the engine is dismantled, examine the main bearings for signs of wear or damage, after the oil has been washed out. The usual indications are chipped or broken rollers, scuff marks in the hardened surface of the rollers, or a feeling of roughness as the bearing is revolved. If there is any doubt at all, play safe and renew the bearing concerned. If a bearing should fail soon after a complete overhaul, a further strip down of the engine will prove necessary.

7 Two different approaches are possible when attending to worn timing side main bearings. The bearings may be renewed outright as complete units or oversize rollers fitted to restore the original running fit. The latter method requires honing of the inner and outer races in conjunction with selection of the correct oversize rollers. Special tools and expertise are required to carry out this operation, which should be entrusted to a Harley-Davidson specialist.

8 To remove the timing side main bearing inner races and cages from the mainshaft, prise off the spiral lockring from the shaft and remove the end washer. Slide the bearing cages off the shaft, taking care that the needle rollers do not fall from position in the cages. The bearing rollers run directly on the mainshaft. If the bearing track is worn, the only remedy is to renew the mainshaft, which requires separation of the flywheels. As noted in paragraph 2, this is a job for a specialist. The timing side main bearing outer race is a press fit in the crankcase and is secured by two grubscrews threaded into the inside of the case. To prevent damage to the housing the crankcase half should be heated to 275 - 300$^{O}$F before the race is drifted from position. The casing should be heated in a similar manner when refitting a bearing outer race. Even after renewal of the timing side main bearings, the outer race must be honed out and suitable rollers fitted, to give the correct running clearance.

9 The drive side main bearing outer races can be removed and refitted with the crankcase half cold. Drift the outer outer race outwards and the inner outer race inwards, using a soft brass drift. To remove the outer races spacing circlip, rotate the circlip in the groove until one end is directly below the oilway drilled at an angle from the inside of the casing through to the centre of the bearing housing. Pass a 1/8 inch parallel side punch, or similar tool through the oilway, to displace the circlip end and then prise the clip out with a screwdriver. The drive side main bearings must be renewed as a set, together with the circlip and the inner race spacer ring. These components should not be replaced individually. The drive side main bearing inner race can be prised off the mainshaft using suitable levers. If the old main bearings are to be reused, ensure that the main bearing outer and inner races are kept in pairs and the components are not interchanged.

10 As can be seen from the procedures described in this Section, attention to the main bearings and flywheel assembly requires no little skill and in some instances the use of special tools. Consequently it is advised that the complete lower end of the engine is returned to a Harley-Davidson specialist unless the owner is confident that he has the experience to carry out the necessary work himself.

### 17 Small-end bearing and gudgeon pin: examination and renovation

1 The small-end bearing consists of a bronze bush pressed into the small end eye and reamed out to give a 0.0008 - 0.0012 in (0.020 - 0.030 mm) clearance with the gudgeon pin. If the clearance between the bush and pin exceeds 0.002 in (0.050 mm) a new bush should be fitted and reamed to give the correct clearance, or the bush should be reamed to take an oversize gudgeon pin, of which four sizes are available in oversize increments of 0.002 in (0.050 mm). The latter course is only recommended when the gudgeon pin has also become excessively loose in the piston pin bosses. The gudgeon pin should be a light push fit.

2 When renewing small end bushes, the new bush can be used to displace the old bush if a simple drawbolt arrangement is used, as shown in the accompanying illustration.

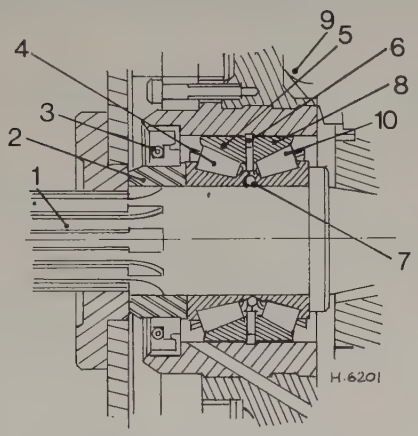



**Fig. 1.5. Drive side main bearing configuration**

1 *Drive side flywheel mainshaft*
2 *Oil seal collar*
3 *Oil seal*
4 *Sprocket side bearing - complete*
5 *Sprocket side bearing - outer race*
6 *Circlip*
7 *Spacer ring*
8 *Flywheel side bearing outer race*
9 *Drive side crankcase half*
10 *Flywheel side bearing - complete*

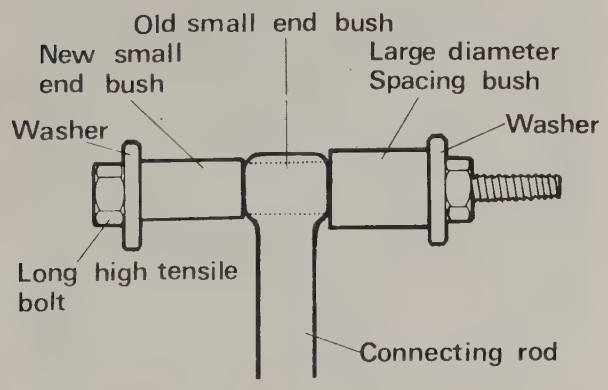
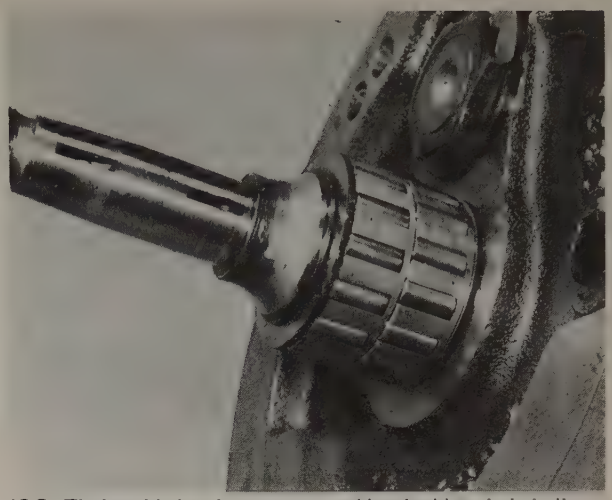
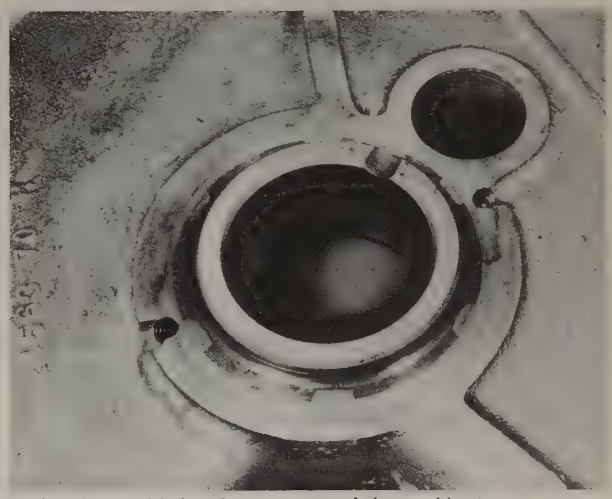



**Fig. 1.6. Method of inserting small end bush**



16.8a Timing side bearings are secured by double spiral circlip



16.8b Timing side bearing outer race is located by two grubscrews

17.1 Check small end bearings for scoring or wear

### 18 Cylinder barrels: examination and renovation

1 The usual indication of badly worn cylinder barrels is excessive oil consumption accompanied by blue smoke from the exhaust and possibly piston slap, a metallic rattle that occurs when there is little or no load on the engine. If the top of each cylinder bore is examined carefully, it will probably be found that there is a ridge on the thrust side, denoting the limit of travel of the uppermost piston ring. The depth of this ridge will vary, according to the amount of wear that has taken place.
2 With an internal micrometer, measure the bore about a ½ inch below the limit of travel of the top ring, firstly from back to front of the barrel, then from side to side. This will show whether the bore has worn oval. Repeat the measurements just above the lower limit of travel of the oil control ring, and then approximately half way between these two measuring points. If the bore has not worn more than 0.002 inch, is not oval or badly scored, it is suitable for re-use.
3 If the bore wear exceeds 0.002 inch or the bore is oval or damaged in any way, a rebore is essential. Oversize pistons are available in seven rebore sizes of 0.010 inch increments up to +0.070 inch. The cylinder should be bored out to the next rebore size.
4 If the cylinder barrel is already at the maximum rebore size of +0.070 inch, it will be necessary to fit a replacement cylinder barrel or to have the original sleeved back to standard size. It is not possible to bore beyond the +0.070 limit without seriously weakening the structure of the cylinder barrel.
5 If an internal micrometer is not available, a general indication of bore wear can be achieved by inserting the piston, minus piston rings, within the bore and taking readings of the clearance in various positions, by feeler gauge. This is not a very accurate check, but should suffice to determine whether more precise measurements are needed to arrive at a decision. Measure each bore separately, so that there is no risk of interchanging the pistons.

### 19 Pistons and piston rings: examination and renovation

1 If a rebore is necessary, the existing pistons and rings can be disregarded as they will be replaced with their oversize equivalents as a matter of course.
2 Remove all traces of carbon from each piston crown, using a soft scraper to ensure the surface is not marked. Finish off by polishing each crown with metal polish, to give a smooth mirror-like surface to which carbon will not adhere so readily in the future. Never use emery cloth, the particles of which will embed in the soft aluminium alloy.
3 Piston wear usually occurs at the skirt or lower end of the pistons and takes the form of vertical streaks or score marks on the thrust side. There may also be some variation in the thickness of the skirt.
4 The piston ring grooves may become enlarged in use, allowing the piston rings to have greater side float. If the clearance exceeds 0.005 inch, the piston is due for renewal. It is unusual however, for this form of wear to occur on its own.
5 Piston ring wear is measured by inserting the piston rings in their respective bores, one at a time, using the skirt of the piston to locate them approximately one inch from the base of the inverted cylinder barrel. Make sure the ring rests square with the bore before measuring the end gap with a feeler gauge. If the gap exceeds 0.020 inch they must be renewed, assuming the cylinder is not in need of a rebore.

### 20 Cylinder heads: dismantling, examination and renovation of the valves, valve seats and valve guides

1 Although the rocker boxes, containing the rocker gear, have been removed, the cylinder heads still contain the valves and their appropriate component parts. Further dismantling is necessary to remove them, for examination and whatever renovation work should prove necessary. Dismantle and reassemble each cylinder head in turn, so that there is no possibility of parts being interchanged.

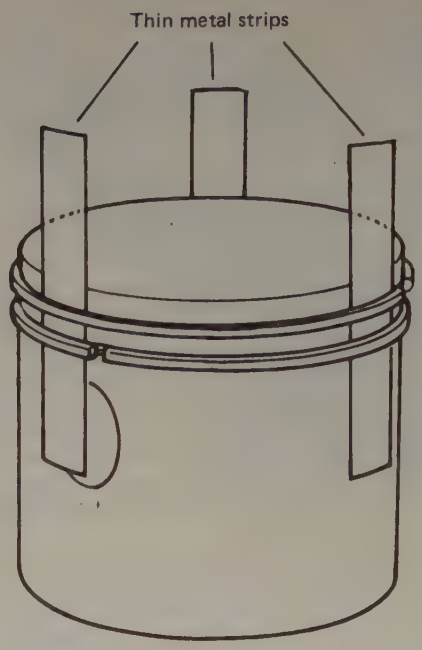



**Fig. 1.7. Freeing gummed rings**

2 Commence by unscrewing the spark plug. A valve spring compressor is necessary to remove the valve springs and valves. When the springs are compressed, the split collets can be lifted out from the top cap, enabling the valve to be released when the compressor is unscrewed. Place the components associated with each valve in separate boxes, to ensure they are assembled together again. It is not possible to interchange the inlet and the exhaust valve because the inlet valves have larger diameter heads.
3 Remove all traces of carbon from the cylinder head and the valve ports, taking care not to scratch the valve seats. Use a soft scraper, otherwise scratch marks may cause hot spots and leakages. Finish by polishing the combustion chamber with metal polish so that carbon will not adhere so easily in the future. **Do not** use emery cloth.
4 Check that the valve guides are free from carbon and burnt oil which may otherwise cause the valves to stick. Make sure the threads of the spark plug hole are clean too.
5 The cylinder head fins must be clean and not clogged with oil or road dirt. Use a wire brush if necessary, taking care not to damage or scratch the fins. A fresh coating of matt black heat resisting paint will help improve heat radiation.
6 After cleaning the valves to remove all traces of carbon, examine the heads for pitting and burning at the ground seating. Examine the condition of the valve seats in the cylinder head. The exhaust valve and its seat will most likely require the most attention because it runs at a higher temperature than the inlet valve. If the pitting is slight, the marks can be removed by grinding the valve and the seat together, using fine grinding compound.
7 Valve grinding is a simple task, carried out as follows: Smear a trace of fine valve grinding compound (carborundum paste) on the seat face and apply a small valve suction grinding tool to the head of the valve. With a semi-rotary motion, grind in the valve head to its seat, using a backward and forward action. It is advisable to lift the valve occasionally to distribute the grinding

compound evenly. Repeat this operation until an unbroken ring of light grey matt finish is obtained on both the valve and seat, completely free from pit marks. This denotes the grinding operation is complete. Before passing on to the next valve, make quite sure that all traces of the grinding compound have been removed from both the valve and its seat and that none has entered the valve guide. If this precaution is not observed, rapid wear will take place, due to the highly abrasive nature of the carborundum paste.

8 Where deeper pit marks are encountered, it will be necessary to use a valve refacing machine and a valve seat cutter, set to an angle of 45°. Never resort to excessive grinding because this will only pocket the valve and lead to reduced engine efficiency. If there is any doubt about the condition of a valve, fit a new replacement.

9 Examine the condition of the valve collets and the portion of the valve stem on which they seat. If there are any signs of damage, new replacements must be fitted. Check also that the valve caps are free from cracks. If the collets work loose or if a valve cap opens up whilst the engine is running, a valve will drop in and cause extensive damage.

10 Measure the valve stems for wear, making reference to the tolerance values given in the Specifications Section of this Chapter. Check the valve guides. If wear is evident, it will be necessary to warm the cylinder head and drive the old guides out from inside the cylinder head, using a two diameter drift, the initial lead of which is the same diameter as the valve stem. Drive the replacement guide into position with the same drift, whilst the cylinder head is still warm. The guides must be a good tight fit in the cylinder heads. If there is any evidence of sloppiness an oversize guide can be fitted. Oversize guides are available in +0.001 in - 0.008 in oversizes. The internal bore of the renewed valve guide will probably shrink fractionally. Restore the correct guide/valve clearance using a reamer. Note that when new valve guides are fitted, it will be necessary to regrind or recut the valve seats.

11 Check the free length of each valve spring against the list of tolerances in the Specifications Section of this Chapter. If the springs are reduced in free length or if there is any doubt about their condition, they should be renewed.

## 21 Rocker boxes: dismantling, examination and renovation

1 It is unlikely that excessive wear will occur in either the rocker arms or the rocker shafts unless the flow of oil has been impeded or the machine has covered a very large mileage. A clicking noise from the rocker area is the usual symptom of wear in the rocker gear.

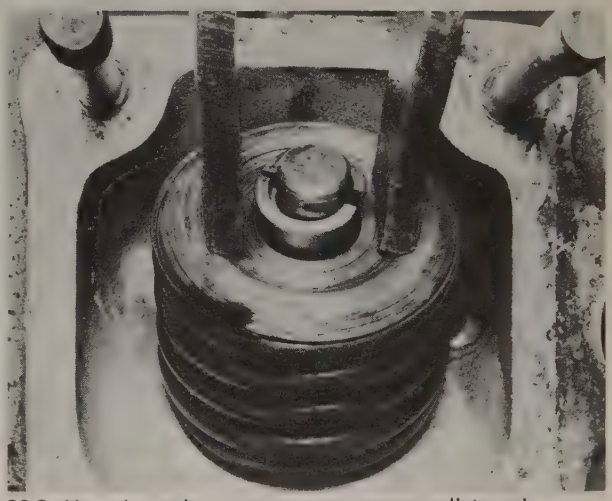
2 The correct clearance between each rocker shaft and rocker arms is 0.0005 - 0.002 in (0.012 - 0.50 mm). If excessive shake is evident, the two rocker arm bushes must be removed and new components pressed in. The correct end play is 0.004 - 0.025 in (0.10 - 0.60 mm).

3 Check the tip of each rocker arm at the point where the arm makes contact with the valve stem. If signs of cracking, scuffing or break through in the case hardened surface are evident fit a new replacement.

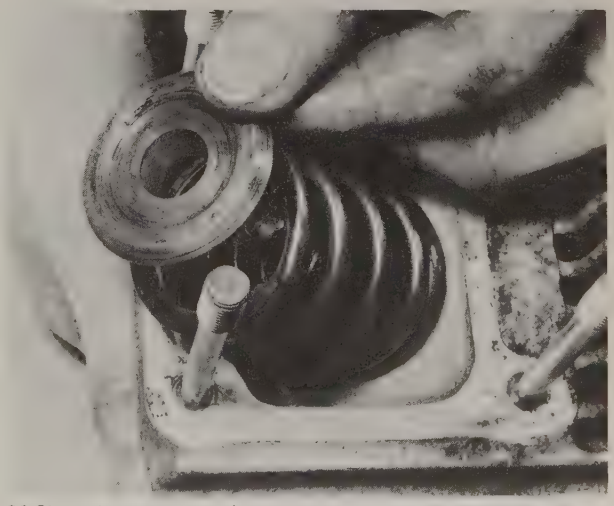
4 To dismantle a rocker box, unscrew the rocker arm socket caps found on the right-hand side of each rocker box. Remove both caps and the sealing washer behind, discarding the 'O' ring. Unscrew the acorn nuts from the other end of the rocker box and tap the shaft out of position, from the acorn nut end. If the rocker shaft rotates when loosening the socket cap, leave the cap in place and drift the shaft out in the normal manner. The cap can then be unscrewed by placing the shaft in the soft jaws of a vice. Displace the end float control spacer and remove the rocker arm. This may take a small amount of manipulation.

5 Removal and replacement of the rocker arm bushes is a straightforward operation requiring a soft drift of suitable diameter. On fitting new bushes it may be found that their internal diameter has been reduced. A reamer should be employed to restore the correct running fit.

19.2 This piston shows advanced 'coking-up'



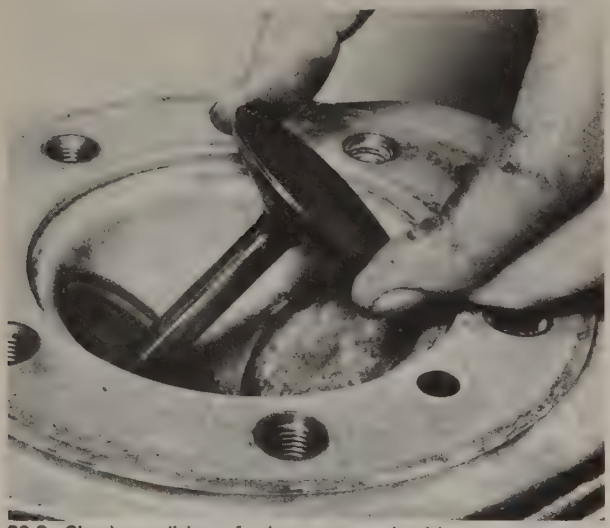
20.2a Use valve spring compressor to remove collets and ...



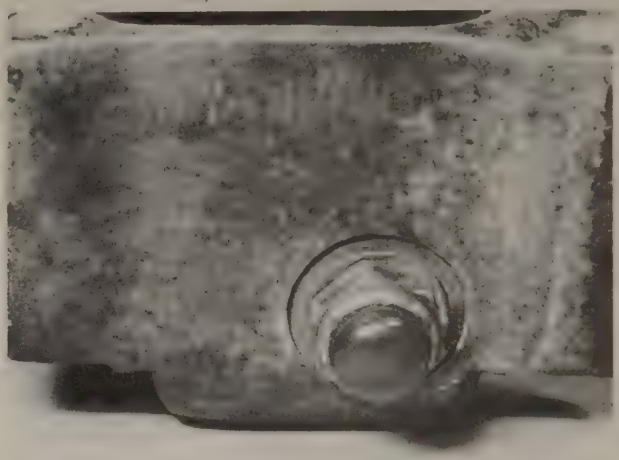
20.2b ... then remove valve top cap

20.2c Valve springs are supported on ...

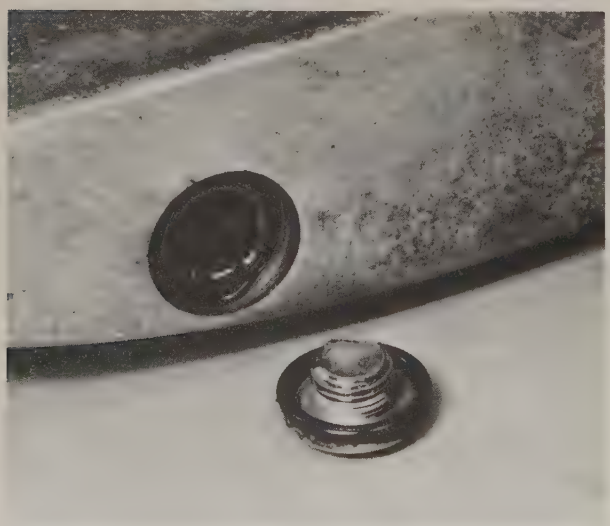
20.2d ... lower spring seat which will lift out



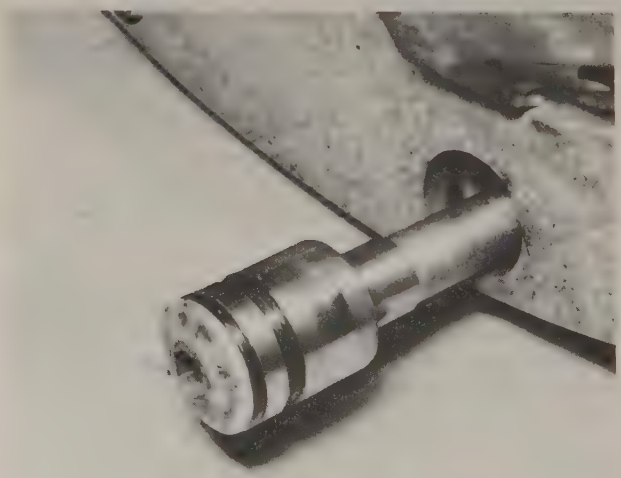
20.2e Check condition of valves, seats and guides



21.4a Unscrew rocker spindle dome nut and ...

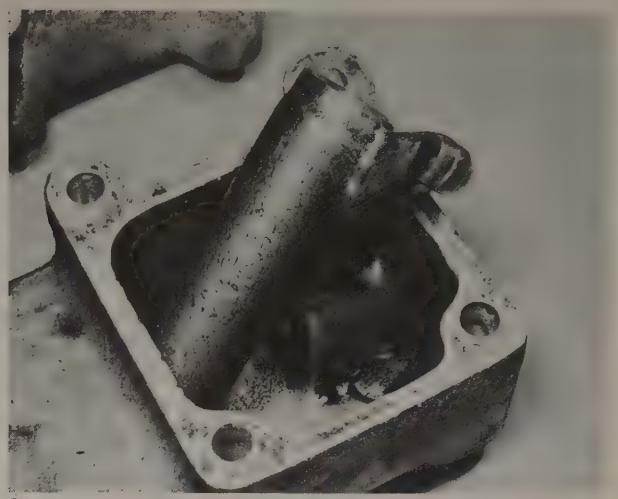


21.4b ... if possible remove screw cap



21.4c Carefully drift spindle from rocker box

21.5a Lift out spacer washer ...



21.5b ... followed by the rocker arm itself

21.5c Check condition of rocker arm bushes

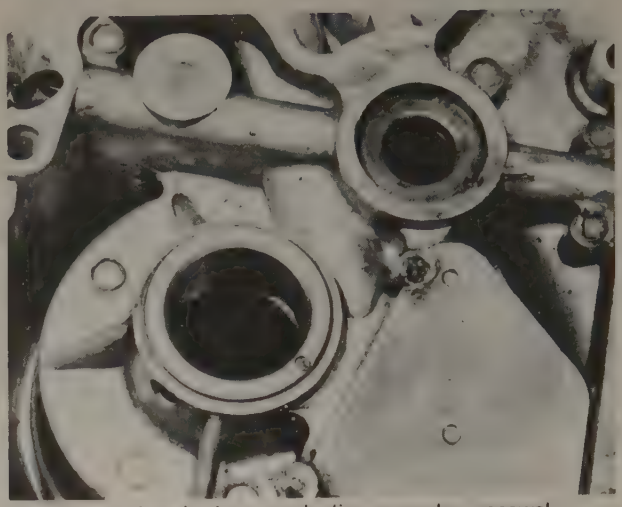
**22 Hydraulic tappets: examination and renovation**

1 Before separating the components of both pairs of hydraulic tappet assemblies, note that it is essential that the various components do not become interchanged with one another. Transposing of parts must be avoided due to the very small running clearances involved.
2 Remove each cam follower and tappet head from the guide block and separate the follower from the tappet. The two component parts of the tappet head can then themselves be separated.
3 Clean the components thoroughly in petrol and allow to dry. Blow out the oil holes with compressed air and use a length of fine wire to ensure that the oil holes in the tappet guide blocks are free.
4 Check the clearance between each cam follower and guide block. If the clearance exceeds 0.003 in (0.076 mm) the components should be renewed. A worn cam roller may be renewed by pressing out the spindle pin. Press a new pin into place and peen over or stake both ends to secure the pin in place.
5 The tappet head must be a perfect sliding fit with no visible score marks on the cylinder into which it fits or the shank of the head. To test the two components insert the tappet head in the cylinder, and without obscuring the oil passage, push the head down fully for six seconds and then release it. If the tappet head bounces back the tappet assembly is in good condition. If the tappet does not bounce back, repeat the test with a finger covering the oil hole in the cylinder. If the piston now returns smartly a badly seating ball valve in the cylinder is indicated. Unless this is caused by a particle of foreign matter on the cylinder ball valve, the complete assembly must be renewed.
6 Check the cap of each tappet head which locates with the pushrod end. If wear is evident the tappets must be renewed; the pushrods will probably require renewal also.

**23 Timing pinions and timing chest bearings: examination and renovation**

1 The timing pinions are unlikely to require attention unless the machine has covered a very high mileage or if there has been a lubrication failure. Wear will be evident in the form of excessive backlash between the individual pinions, with a characteristic 'clacking' noise.
2 The condition of the cams should be checked, to see whether there is any break-through of the case hardened surface in the form of pit marks, scuffing or general indentation. Wear will be particularly evident on the flanks of the cam, at the point where the cam commences to lift the valve and close it. If there is any doubt about the condition of the cams, the camwheel pinions should be renewed, as a precaution.
3 If the cams are worn or damaged, it is probable that the cam followers will require attention too.
4 The needle roller bearing within the timing chest should be renewed if there is any play evident or if there is any sign of roughness. This also applies to any plain bushes. Renewal of these bearings is a specialist task, especially in the case of bushes, which may need to be reamed out, after the new replacements are in position. This type of repair, needed only after an extensive mileage has been covered, is best entrusted to a Harley-Davidson specialist. Don't forget the timing cover, which has its own bearings of the plain bush type. These also require line reaming after renewal.

22.2 Hydraulic tappets - general view



23.4 Timing chest bushes must be line-reamed on renewal

### 24 Crankcase castings: examination and renovation

1 After thorough cleaning, the crankcase casting should be examined for cracks or any other signs of damage that may ultimately cause failure. Minor cracks can be repaired by a welding specialist, but if more extensive damage is apparent, renewal is the only effective remedy.
2 Note that crankcases are always supplied as a matched pair and on no account should only one half be renewed. This is important as the crankcases are line bored in pairs, so that the bearing housings are aligned correctly. Renewal of only one half will result in a mismatch, which may cause the crankshaft to run out of line and absorb a surprising amount of power.
3 Take great care to ensure the jointing faces are undamaged, otherwise oil leaks will prove inevitable on reassembly. If there is some doubt about their sealing properties on reassembly, use a sealant of the liquid gasket type, at this joint.
4 Check the bearing housings to make sure they are undamaged. If they have worn as the result of a bearing rotating, it is possible to effect a permanent cure by using a special bearing sealant such as Loctite, on reassembly. This can be used successfully only if the amount of wear is small.
5 Now is the opportunity to re-tap any of the threads, if they require attention. Most damage is caused by overtightening the drain plugs. If necessary, a thread can be reclaimed by using a Helicoil thread insert, which will permit the original drain plug to be reused. Most dealers have the facilities for effecting this quite cheap but permanent repair.

### 25 Oil seals: examination and renovation

1 Two oil seals only are fitted to the engine unit. One is on the drive side mainshaft fitted in the crankcase outboard of the main bearings, the other in the timing chest cover, sealing the camshaft boss.
2 Because of the low cost of replacement and the difficulty of ascertaining their condition, it is recommended that both oil seals are renewed when the engine has been dismantled. The mainshaft oil seal is drifted out when the outer taper roller bearing cage and inner race is removed. The camshaft seal can be prised from position, using a screwdriver.

### 26 Reassembling the engine unit: general

1 Before reassembly is commenced, the various engine components should be cleaned thoroughly and placed close to the working area.
2 Make sure all traces of old gaskets have been removed and that the mating surfaces are clean and undamaged. One of the best ways in which to remove old gasket cement is to apply a rag soaked in methylated spirits. This acts as a solvent and will ensure the cement is removed without resort to scraping and the consequent risk of damage.
3 Gather together all the necessary tools and have available an oil can filled with clean engine oil. Make sure all the new gaskets, oil seals and replacement parts are available; there is nothing more frustrating than having to stop in the middle of a reassembly sequence because a vital gasket or part has been overlooked. If it is necessary to make a gasket, extreme care should be taken to ensure the profile is identical to that of the original. It is not sufficient to cut around the edges. Use genuine gaskets whenever possible, which will obviate this problem.
4 Make sure the reassembly area is clean and well lit, with adequate working space. Refer to the torque and clearance settings wherever they are given. Many of the smaller bolts are easily sheared if overtightened. Always use the correct size screwdriver bit for the crosshead screws and **never** an ordinary screwdriver or punch. Remember that if the heads are badly damaged during reassembly, the screws may prove almost impossible to undo on the next occasion.

### 27 Engine reassembly: joining the crankcase halves

1 Refit the timing side main bearing cages and rollers onto the right-hand mainshaft and the innermost tapered drive side main bearing onto the left-hand mainshaft. The tapered bearing should be drifted into place using a length of tubing.
2 Support the flywheel assembly securely on wooden blocks so that the right-hand mainshaft is facing downwards. Lubricate the tapered bearing with clean engine oil and position the drive side crankcase over the shaft. Ensure that the connecting rods do not foul the crankcase mouths when the crankcase is lowered into position.
3 Place the bearing inner race spacer ring over the mainshaft and fit the outer tapered bearing in a manner similar to that used for fitting the inner bearing. Ensure that the outer bearing is fully home and check that there is a small amount of end float in the flywheel assembly. If there is no end play, the tapered bearings are under pre-load. This condition must be rectified by pressing the flywheel assembly out of the bearing and fitting one or more shims between the bearing spacer and one of the bearing inner races. Shims are available in 0.003 in (0.076 mm) sizes. Adjust the end float to 0.001 - 0.006 in (0.025 - 0.152 mm).

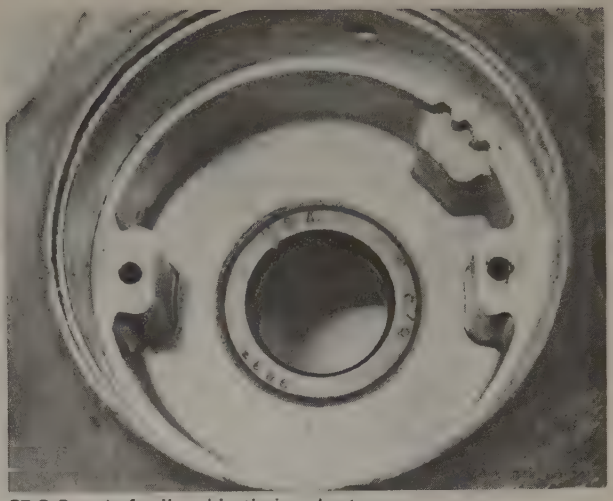
4 Place the oil seal collar onto the shaft so that the widest diameter faces inwards. Drift the collar onto the shaft, using a length of tubing with the inside diameter slightly larger than the mainshaft. Lubricate the sealing lip of the crankshaft oil seal and slide it over the mainshaft and oil seal collar, so that the spring side is facing outwards. Taking care that the oil seal remains square, tap it fully home in the casing. Check that the flywheel assembly rotates freely in the crankcase half.

5 Invert the flywheel assembly, again blocking it securely on the workbench. Check that the timing side main bearing spiral lock ring is in position and lubricate the bearing with clean engine oil.

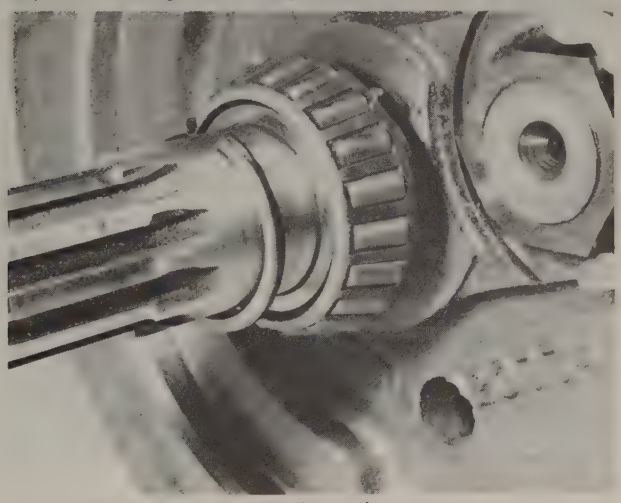
6 Clean the mating surfaces of both crankcase halves and apply a non-hardening gasket compound to the left-hand crankcase mating surface. Position the right-hand crankcase half over the mainshaft and lower it into position so that the crankcase stud holes align.

7 Insert the six crankcase studs and the two bolts and fit the stud washers and nuts. Note that the uppermost stud (between the crankcase mouths) retains the speedometer drive cable clip on the left-hand side. Before tightening the nuts and bolts evenly in a diagonal sequence, tap the crankcases round so that the cylinder barrel surfaces are exactly aligned. During tightening of the nuts check that the flywheel assembly still revolves freely.

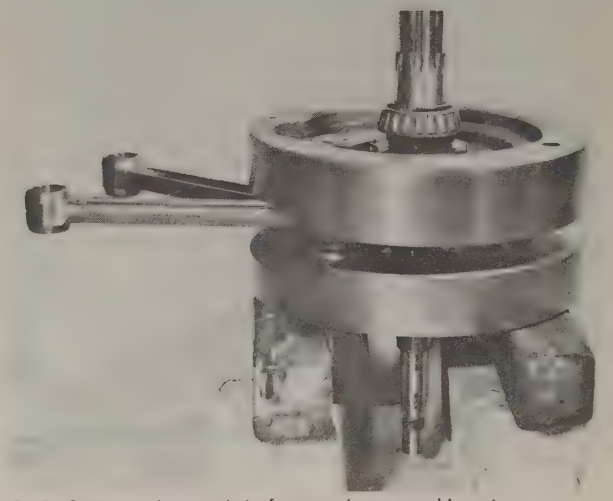
8 Before continuing, pad the crankcase mouths with clean rag to prevent the ingress of foreign matter.



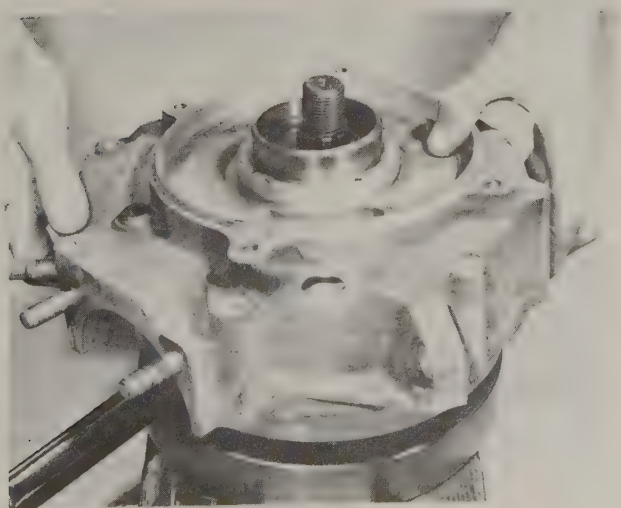
25.2 Camshaft oil seal in timing chest cover



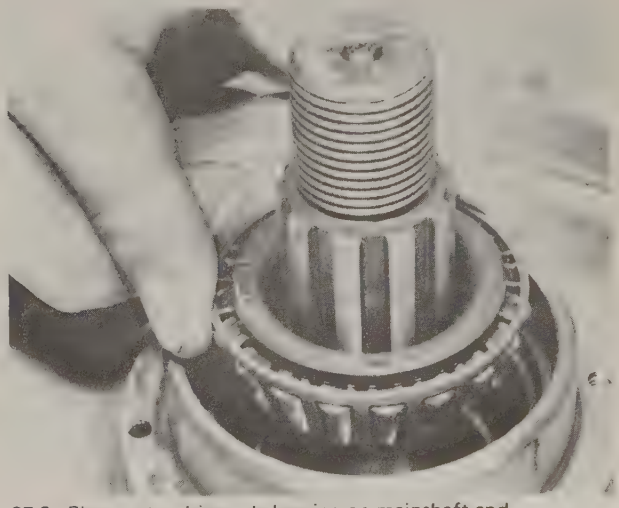
27.1 Refit drive side inner bearing and spacer



27.2a Support the crankshaft securely on workbench

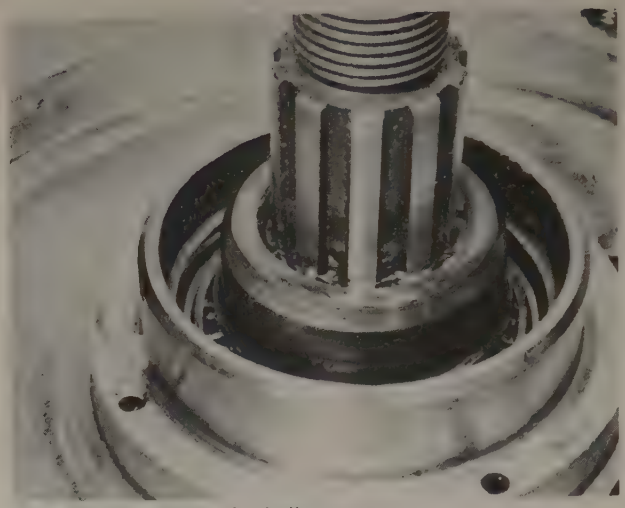


27.2b Place drive side crankcase over bearing

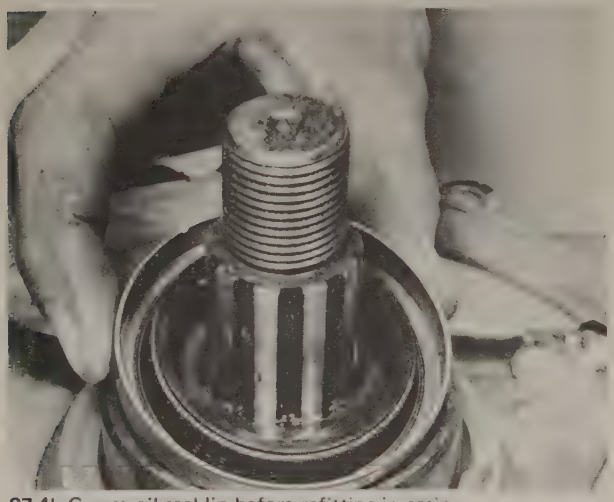


27.3a Place outer drive side bearing on mainshaft and ...

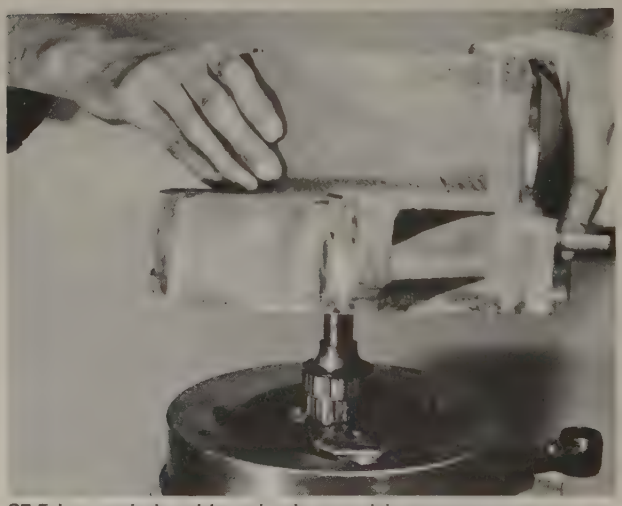
27.3b ... drift into place using tubular drift



27.4a Fit oil seal collar in similar manner



27.4b Grease oil seal lip before refitting in casing



27.5 Lower timing side casing into position

**28 Engine reassembly: refitting the oil pump**

1 If the oil pump has been dismantled it must be reassembled as described in Chapter 4, Section 15. Use new gaskets throughout, but no gasket cement.

2 Lubricate the oil pump driveshaft and slide the shaft through the bush in the timing chest so that the oil pump is up against the milled surface of the chest. As the shaft is inserted, the driven pinion must be fitted. Due to lack of space, the pinion cannot be fitted once the shaft is fully home. Align the pinion keyway and shaft keyway, and insert the small Woodruff key to secure the two components together. Fit the pinion retaining circlip. Insert the four oil pump bolts and fit the two washers and nuts. Tighten the nuts and bolts evenly in a diagonal sequence. Keep checking that the pump revolves quite freely as uneven bolt tension may cause misalignment. A badly cut gasket may cause the internal gears to bind, by fouling them during rotation.

3 Do not overtighten the oil pump or distortion will occur, causing oil leakage. A torque setting of 50 - 60 in/lbs (4 - 5 ft lbs/0.553 - 0.691 kg m) is recommended.

4 Apply a locking fluid to the crankcase breather union and screw it into the crankcase to the rear of the oil pump. Reconnect the union with the chain oiler take-off at the oil pump. Secure the union hose with new clips of the original type or ordinary screw clips.

**29 Engine reassembly: replacing the timing pinions and timing the camshaft and breather**

1 Place the inner Woodruff key in the keyway on the mainshaft and slide the oil pump drive gear into position. Refit the spacer collar and outer Woodruff key and similarly replace the timing pinion with the timing marks facing outwards. Lock the crankshaft using a close fitting rod through one connecting rod small end eye, and fit and tighten the timing pinion special nut.

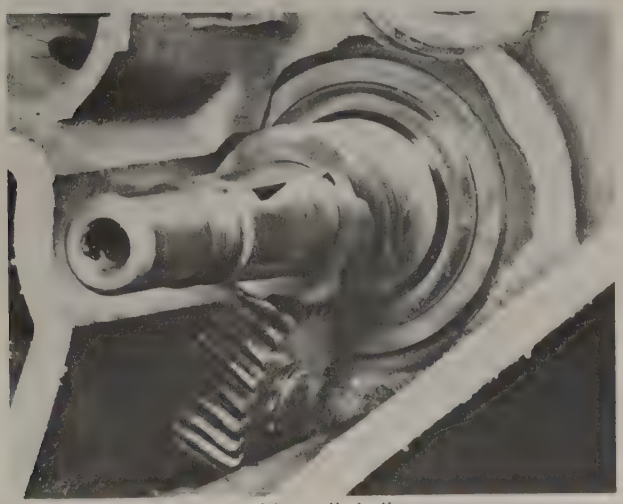
2 Slide the timed breather into position in the timing case. Before proceeding further with assembly, the timed breather end float should be checked and, if necessary, adjusted. Fit a new timing chest gasket and position the timed breather thrust washer on the end of the breather. Place a straight edge across the gasket and measure the gap between the straight edge and breather washer with a feeler gauge. Subtract 0.006 in (0.152 mm) from the measurement to find the end float, which should

be 0.001 - 0.005 in (0.025 - 0.127 mm). If the end float is incorrect, substitute the thrust washer with one of alternative thickness. The washers are available in 0.115, 0.120 and 0.125 in (2.92, 3.04 and 3.17 mm) sizes.

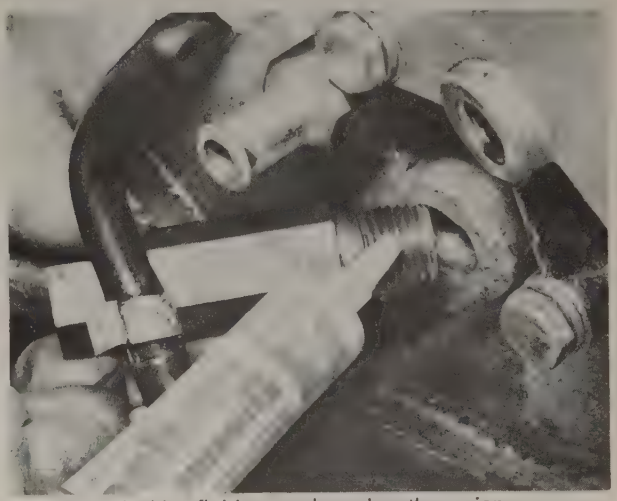
3 Lubricate the camshaft needle roller bearing and the plain bushes within the timing chest cover. Rotate the flywheel until the left-hand mark on the timing pinion face is at 12 o'clock. Fit the special backing washer to the rear of the crankcase so that the camshaft needle roller bearing is covered. Place the shim on the inner end of the camshaft and fit the camshaft so that the timing marks align. (See accompanying photograph). Fit the timed breather end float washer.

4 Lubricate the lip of the camshaft oil seal and fit the timing cover, together with the new gasket. Fit the six cover screws and tighten them evenly, in a diagonal sequence. The camshaft end float must be ascertained, and if outside the 0.001 - 0.005 in (0.025 - 0.127 mm) range must be adjusted by means of special cam gear shims. A dial gauge mounted on the timing chest cover should be used to test the end play. Shims are available in five increments of 0.005 in (0.127 mm) to 0.050 in (1.27 mm).

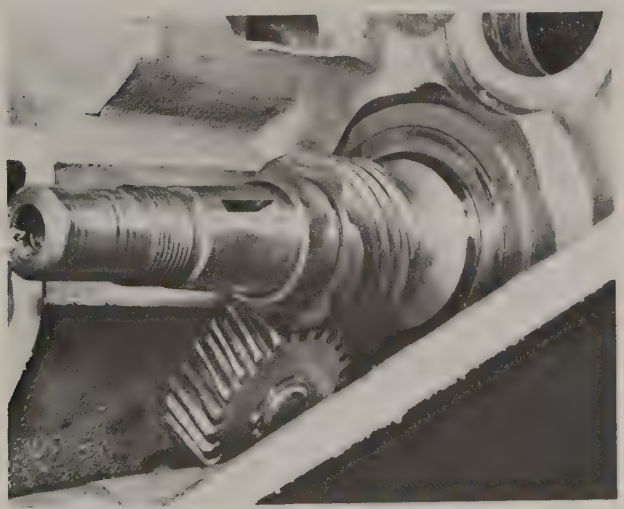
28.2a Fit oil pump driven gear, THEN fit Woodruff key



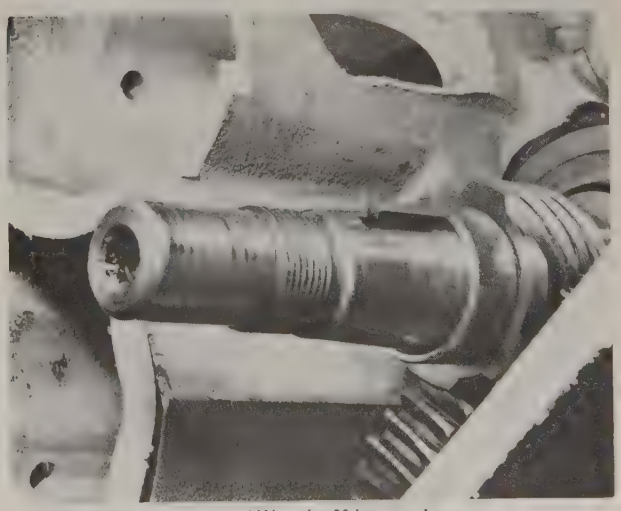
28.2b Secure pump gear with small circlip



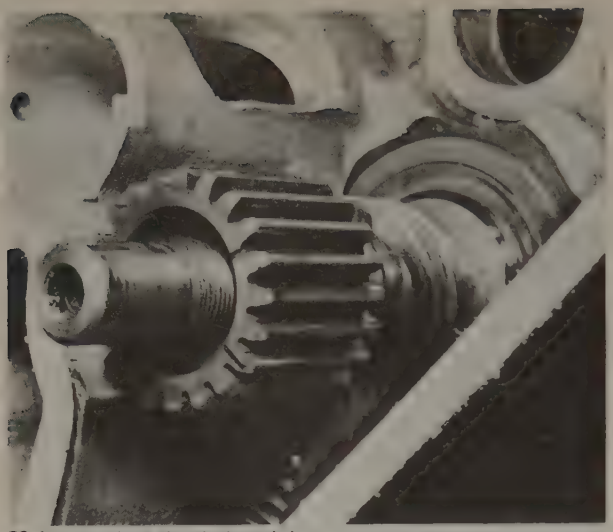
28.4 Apply locking fluid to crankcase breather union



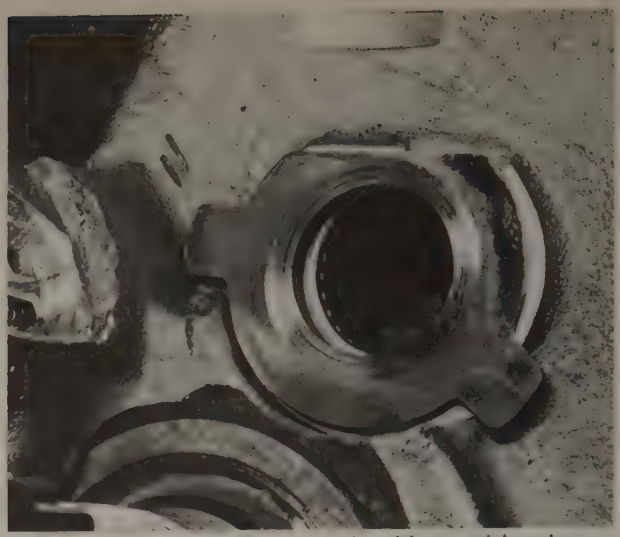
29.1a Refit the oil pump drive pinion and collar



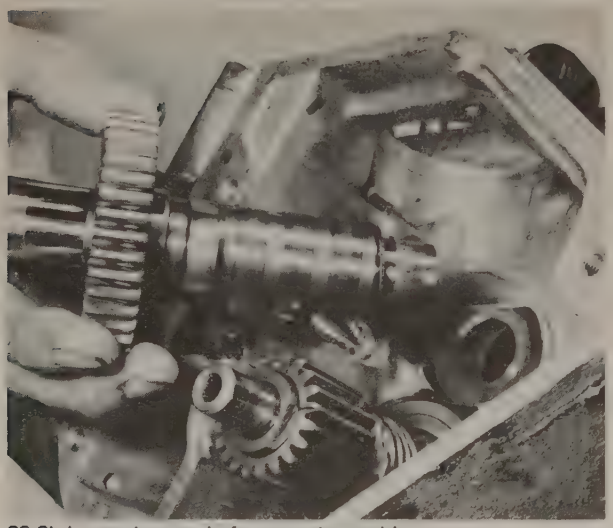
29.1b Replace the second Woodruff key and ...



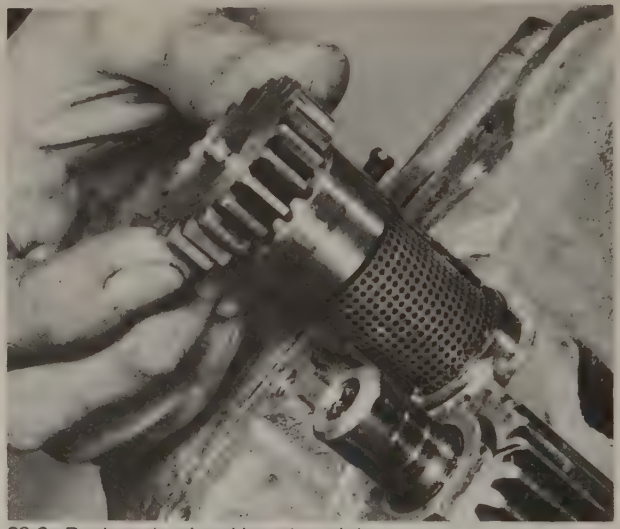
29.1c ... replace the timing pinion



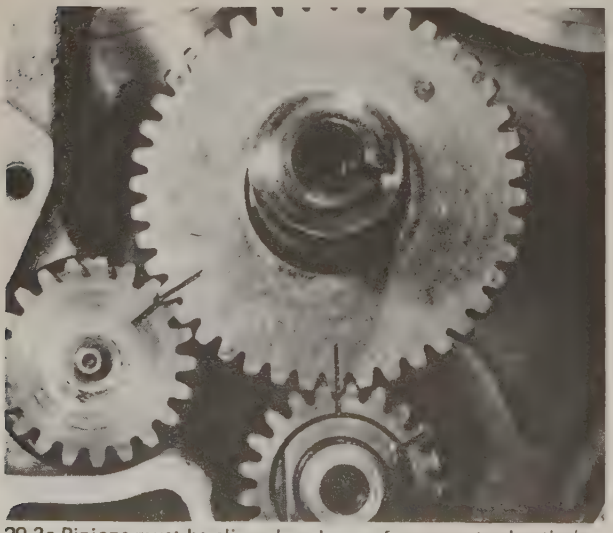
29.2a Insert needle roller bearing and position special washer



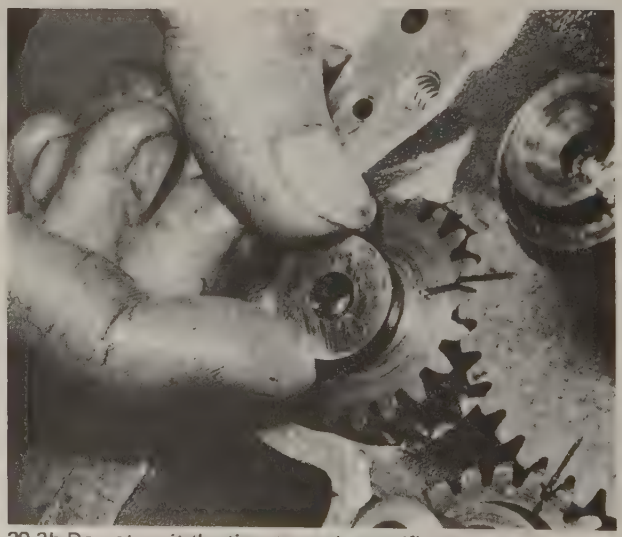
29.2b Insert the camshaft - note thrust shim



29.2c Replace the timed breather pinion



29.3a Pinions must be aligned as shown, for correct valve timing



29.3b Do not omit the timed breather endfloat washer

29.4 Use a new gasket at the timing chest joint

crankcase mouth (no gasket cement).

3 Due to the small amount of lead-in at the base of each cylinder sleeve, insertion of the piston into the bore is almost impossible without the use of a piston ring clamp. A tool of this type will prevent the breakage of piston rings. Ease the cylinder barrel down gently until the clamp is displaced and the piston rings have entered the bore. Remove the rag from the crankcase mouth and lower the cylinder barrel until it seats over the four retaining studs. Replace and tighten the four nuts and flat washers. If a piston ring clamp is not available, or the clamp is of such a depth that it cannot be fitted below the piston an alternative method of piston and cylinder barrel reassembly can be adopted. Insert the piston into the cylinder bore from the top, contracting each ring individually until the piston is fully home. Push the piston down until the gudgeon pin bosses are clear of the cylinder barrel skirt. Fit the gudgeon pin in the normal manner. If this method is used, two people must be employed; one to hold the barrel and piston, the other to insert the gudgeon pin and fit the circlips.

4 Repeat the procedure for the second cylinder barrel.

### 30 Engine reassembly: replacing the automatic advance unit and contact breaker

1 Replace the automatic advance unit, which will locate with the protruding end of the camshaft. Refit the contact breather baseplate, aligning the scribe marks made earlier so that the ignition timing is approximately correct. Replace the retaining screws and tighten them.

2 Refit the contact breaker cam, which is formed to locate with the end of the automatic advance unit in one position only. Refit and tighten the centre retaining bolt, taking care not to over-tighten and shear the bolt. Temporarily replace the end cover and gasket, retaining it with the two screws.

### 31 Engine reassembly: replacing the cam followers

1 Squirt oil through the openings in the top of the timing chest so that the timing pinions and cams are liberally coated with oil. Place a new gasket over each opening. Lubricate the various components of each cam follower and guide block. Note that the cam followers must be fitted with their machined faces and oil hole facing inwards. To prevent the cam follower assemblies from falling into the timing chest during reassembly, pinch the two tappet heads together as the guide block is lowered into position.

2 Fit and tighten the four countersunk bolts holding each guide block.

3 Replace the hydraulic tappet oil feed filter and backing spring into the recess in the top of the timing chest. The closed end of the filter must face upwards. Ensure that the sealing washer on the plug is in good condition before replacing.

### 32 Engine reassembly: replacing the cylinder barrels

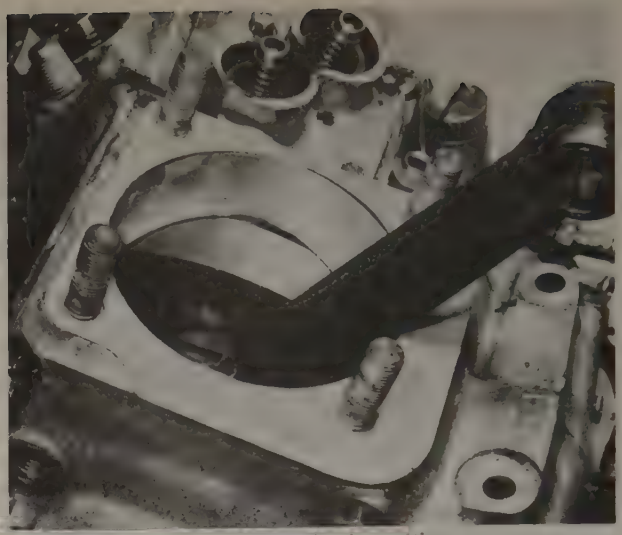
1 Pad each crankcase mouth with clean rag, then fit the pistons using new circlips. If the gudgeon pins appear to be a tight fit, warm the pistons first, so that they are expanded and the gudgeon pins will push in. Check that each circlip has located correctly with its respective groove in the piston boss. If one should work loose whilst the engine is running, serious engine damage will result. Don't forget to oil the gudgeon pins and small end bushes, prior to insertion.

2 Oil each cylinder bore. Check that the piston rings fitted to each piston are spaced so that their end gaps are not in line but preferably spaced at 120°. Fit a new gasket to each

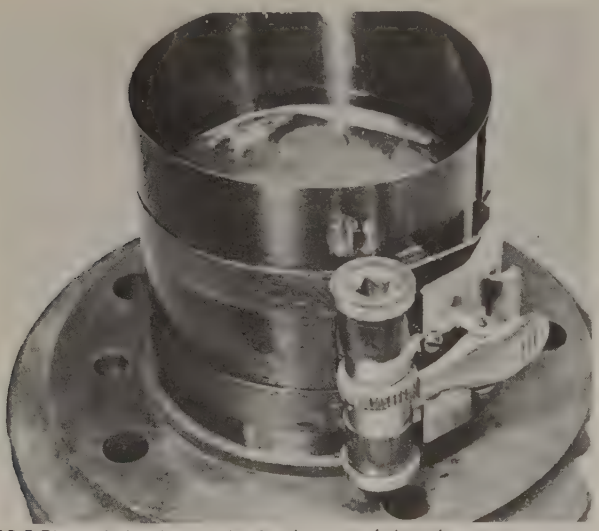
31.1a Oil hole in cam follower MUST face inwards

31.1b Guide blocks are marked 'REAR' and 'FRONT'

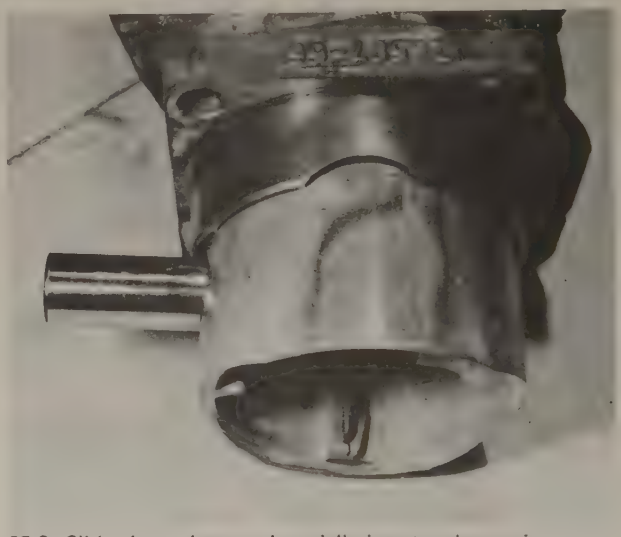
31.2 Use new gaskets on guide block bases



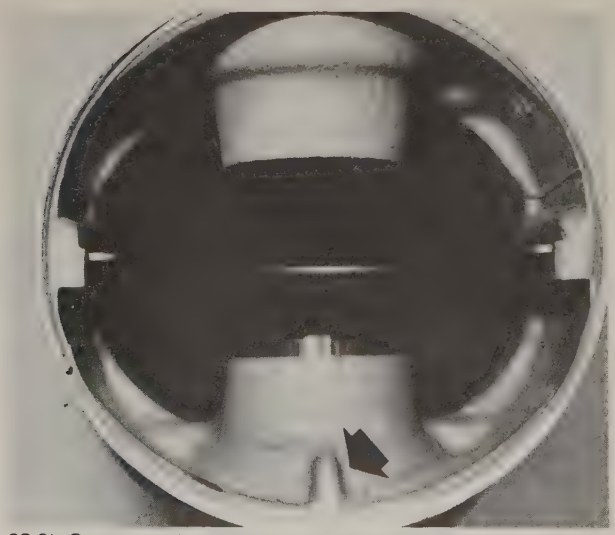
32.1 Place new cylinder base gasket in position



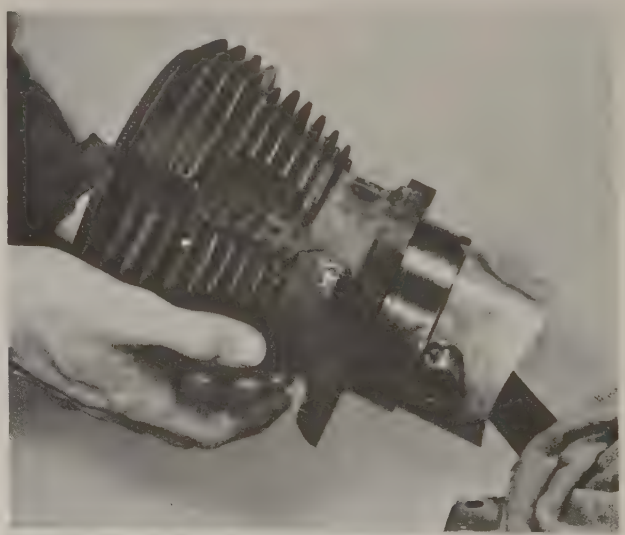
32.2 Piston being inserted using 'car type' ring clamp



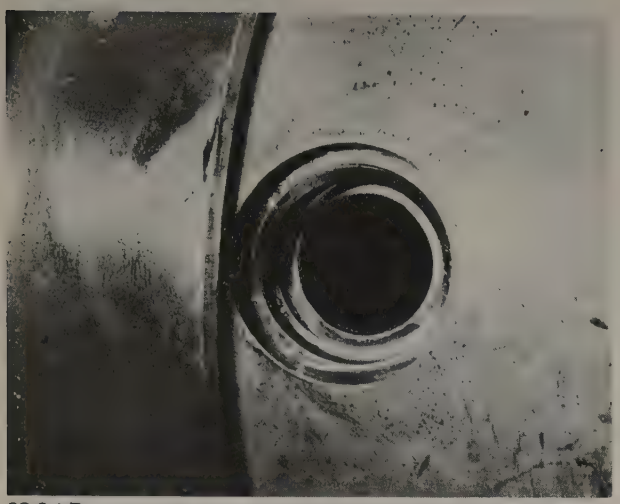
32.3a Slide piston down and partially insert gudgeon pin



32.3b Gusset on piston must be on right-hand side of engine



32.3c Position cylinder barrel and piston and insert gudgeon pin



32.3d Ensure gudgeon pin circlips are fully home

### 33 Engine reassembly: replacing the rocker boxes and cylinder heads

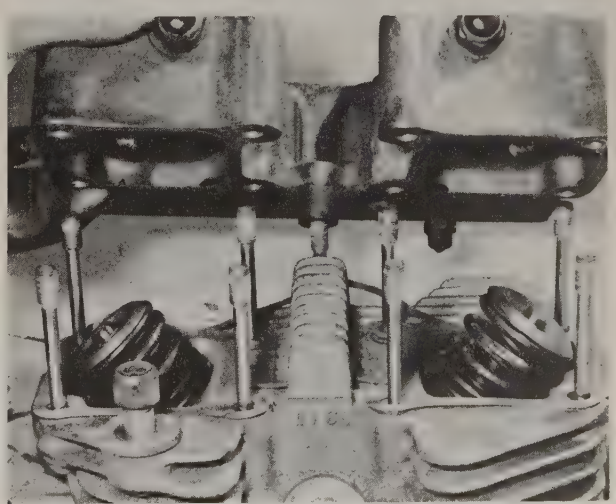
1 If the rocker boxes have been dismantled, they should now be reassembled, keeping their component parts in their original locations. Oil the rocker shafts prior to insertion and fit new sealing washers behind the acorn nuts at the right-hand end. It is also advisable to fit new 'O' rings behind the caps at the left-hand end.
2 Likewise, if the cylinder heads have been dismantled for attention to the valves and/or valve guides, they must be reassembled by reversing the dismantling procedure. Oil the valves and guides prior to their replacement and check that the collets that retain the valve caps have seated correctly. A sharp tap on the end of each assembled valve should suffice.
3 Fit a new gasket over the studs on the rocker box mating surface of the cylinder head. To prevent the heel of each rocker arm fouling the valve springs when the rocker box is fitted to the cylinder head, place the inverted rocker box on the work-bench and lower the cylinder head into position. Hold the two components together, invert them and fit the nine retaining nuts and washers. Tighten the nuts down evenly, in a diagonal sequence. The recommended torque wrench setting is 15 ft lbs (2.073 kg m).
4 Refit the cylinder heads, noting they are 'handed' and cannot inadvertently be interchanged. Use a new cylinder head gasket in each case (no gasket cement) and tighten the five retaining bolts in an even, diagonal sequence. A torque wrench setting of 65 ft lbs (8.9 kg m) is recommended for these five bolts.
5 Separate the components of each pushrod tube by removing the keeper plate from the upper portion of each tube. Renew the tube central sealing cork washer and also the cork washer which fits in the tube recess in the cylinder head and the tappet guide blocks. Reassemble each pushrod tube, without the keeper plate, in the retracted position and fit each to the guide block recess.
6 The pushrods should be fitted in the following sequence. Rotate the engine until the front cylinder exhaust tappet is just beginning to lift. There is now sufficient clearance to fit the rear cylinder exhaust pushrod. If necessary, loosen the pushrod adjustment locknut and screw in the adjuster to shorten the pushrod. Rotate the engine further until the front cylinder inlet tappet is just beginning to lift and fit the rear cylinder inlet pushrod. Repeat the procedure to fit the front cylinder pushrods.
7 Rotate the engine until one valve is fully open, the counterpart of this valve on the other cylinder is now fully closed and the tappet clearance can be checked accurately. Loosen the pushrod adjuster locknut and screw in the adjuster until there is perceptible slack. Slowly unscrew the adjuster until the slack is just eliminated. Mark the adjuster with a piece of chalk and then unscrew it **exactly** four (4) turns. Tighten the locknut. Extend the pushrod tube so that the upper and lower ends of the tube are located against the cork washers, and then fit the pushrod keeper plate.
8 Repeat the operation on the remaining three pushrods.
9 Refit the rocker oil feed pipe which runs from the crankcase to the rear rocker box, and also the rocker box connection oil feed pipe. Use new rubber seals at each union.
10 Refit the induction manifold ensuring that the retaining clips are fully tightened to prevent air leaks. If required, fit new sealing 'O' rings.

### 34 Engine reassembly: replacing the alternator

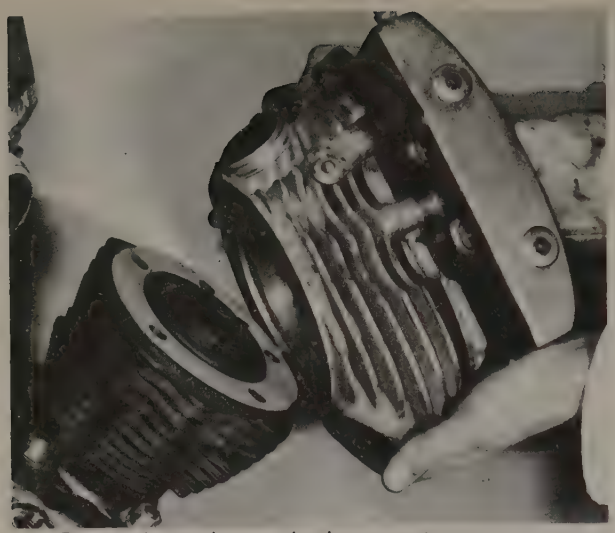
1 Place the alternator stator over the drive side mainshaft so that it rests in approximately the correct position. Insert the wiring plug into the recess in the crankcase and push it home very carefully until the ridge moulded on the plug abuts against the inside edge of the casing. Refit the wiring lead bridge piece and tighten the two screws.
2 Align the alternator stator so that the four retaining bolts can be inserted. Do not forget the double lock plates. Tighten the bolts evenly and then secure them by bending the ears of the plates.
3 Fit the alternator rotor onto the splines of the mainshaft and tap it fully home.

### 35 Replacing the engine unit in the frame

1 As will have been evident during engine removal, there is very little clearance available for manoeuvering the engine unit into its correct location. It is recommended that three persons be available during this operation - two to lift the engine and locate it correctly, whilst the third person steadies the frame. Lift the engine in from the left-hand side of the machine.
2 When the engine is in position fit the two front and two rear engine mounting bolts, taking care not to damage their threads as they are tapped into place. Move the engine as necessary to align the bolt holes and so ease bolt replacement. Fit and tighten the nuts. Replace the engine head steady bracket and tighten the retaining nuts and the main bolt. Note the washer that lies between the frame lug and bracket. This should not be omitted or the stress will strain the bracket and frame.



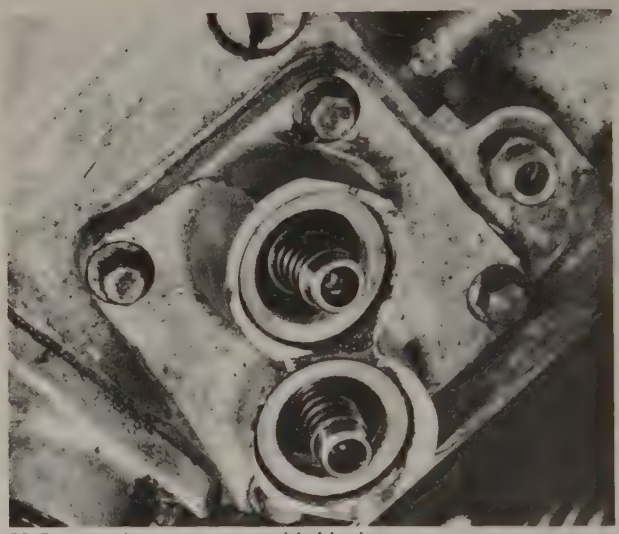
33.3 Replace the rocker box using a new gasket



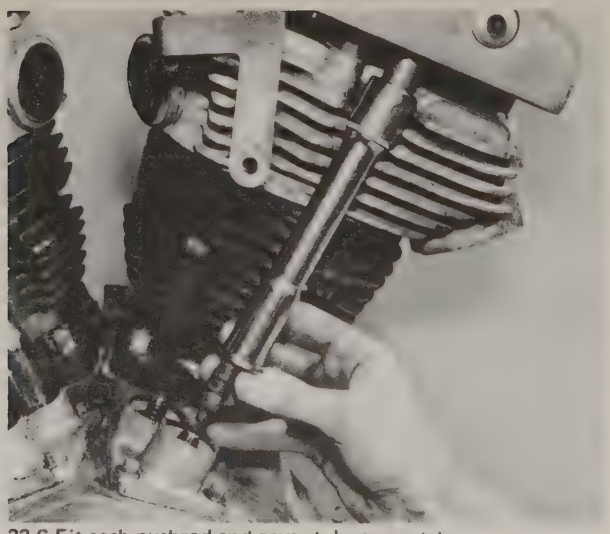
33.4 Fit cylinder head and rocker box as unit

33.5a Fit new sealing gasket to pushrod tube and reassemble

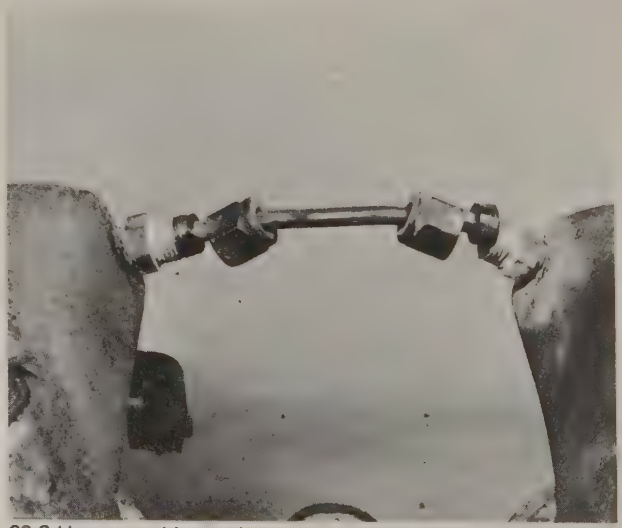
33.5b Fit new cork sealing washers to rocker boxes and ...



33.5c ... to the two tappet guide blocks

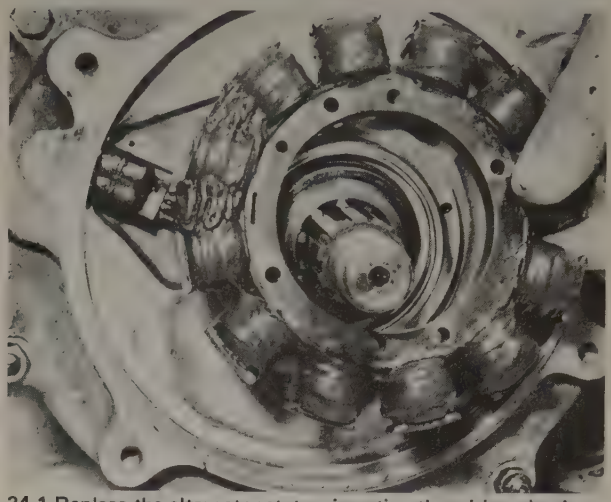


33.6 Fit each pushrod and cover tube separately



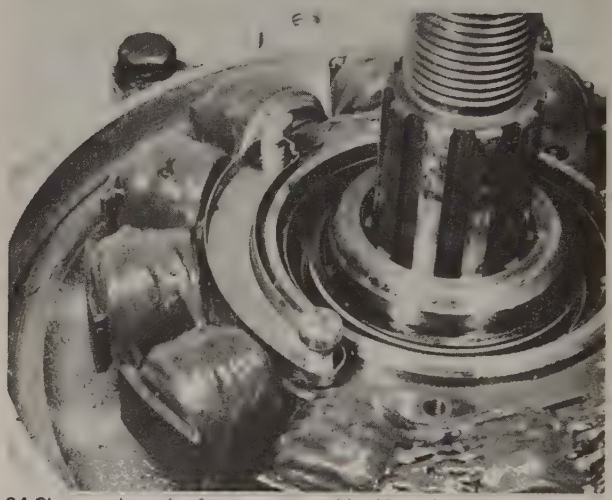
33.9 Use new rubber seals at rocker cross-over pipe

33.10 Do not omit 'O' rings on replacement of inlet manifold



34.1 Replace the alternator stator, inserting the wiring plug in crankcase

34.2a Refit the bridge piece to secure the wires and ...



34.2b ... replace the four screws and locking plates

## 36 Engine reassembly: replacing the primary drive and clutch

1 If the gearchange link rod was disconnected at the gear selector box it should be refitted before the primary chain inner case is replaced. Ensure that the rod is the correct way up or the clevis fork will bind on the selector box arm, causing loss of selection.

2 Place a new 'O' ring over the crankcase boss upon which the primary chain inner case locates. Apply 'Grade A' Loctite or a similar type of locking/sealing fluid to the inner box of the chaincase journal ball bearing. Position the chaincase inner and reconnect the oil feed and return pipes at the rear of the casing. Use new hose clips where necessary. Push the case fully home, so that it engages with the four studs projecting from the gearbox.

3 Fit the four bolts which secure the chaincase to the crankcase, and tighten them down evenly. The two inside bolts were wire-locked on original assembly. This may be repeated, or providing that the casing and bolt threads are perfectly clean, a locking fluid utilised. It is important that some method of securing the bolts is utilised, to prevent the bolts unscrewing and fouling the primary drive.

4 Fit the four transmission stud bolts together with the oil breather orifice cover plate (where utilised). Note that the cover plate is fitted with two washers on the inside of the plate, nearest the chaincase. Tighten the four nuts down evenly, in a diagonal sequence. When refitting the primary chaincase inner, the gearbox mounting bolts must be slack to prevent any strain being placed on the casing, and so allow it to self-align.

5 Tighten the five gearbox mounting nuts.

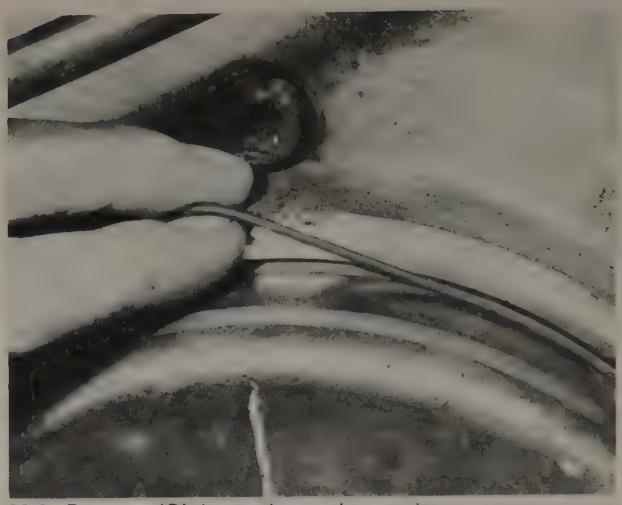
6 Grease the clutch operating pushrod and insert it in the hollow gearbox mainshaft. Fit the Woodruff key into the keyway in the tapered portion of the mainshaft and slide the clutch centre boss into place so that the Woodruff key engages with the keyway in the clutch boss. Replace the centre nut and locking tab washer. Lock the gearbox mainshaft by engaging top gear and applying the rear brake, and then tighten the centre nut. Bend up the tab washer to secure the nut. Remember the nut has a left-hand thread.

7 Refit the engine sprocket spacer washer and sprocket sleeve onto the engine mainshaft. Lubricate the clutch bearing with clean engine oil. Assemble the engine sprocket and the clutch outer drum on the workbench so that they are meshed with the primary drive chain. The chain should be complete with tensioner assembly. Lift the assembled units up as a whole and

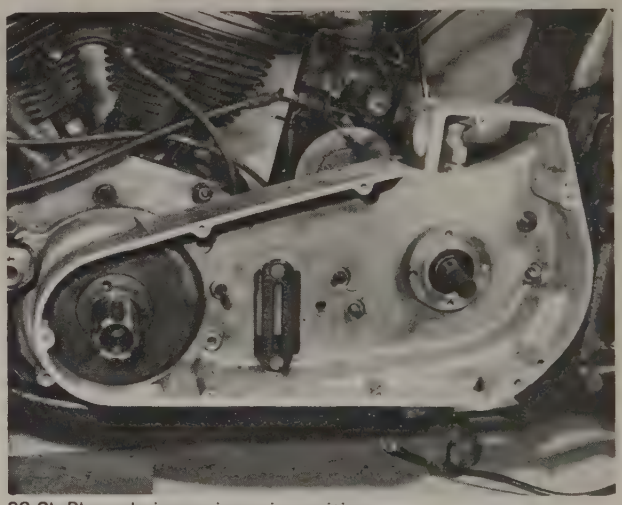
slide the sprocket and clutch drum into place in the chaincase.
8 Replace the clutch plates one at a time, commencing with a plain plate, followed by a friction plate. Continue fitting the plates alternately. The plain plates are marked 'OUT' on one side and should be replaced accordingly. In addition, the spring loaded buffers should be staggered in the outer drum.
9 Replace the spring/pressure plate assembly and fit the three nuts, with the indented face of each nut pointing inwards. Tighten the nuts down evenly until the large washer on the adjuster screw becomes loose. Remove the locknut, discard the large washer and then refit the locknut. Tighten or loosen the three nuts until the distance between the clutch pressure plate and the back of the spring plate is 1 1/32 inch (25.5 mm).
10 Refit the engine sprocket retaining components and the retaining nut. Tighten the nut fully after placing the machine in gear and applying the brakes.
11 Fit the chain tensioner centre bolt so that it engages with the sliding nut in the rear of the serrated adjuster bar. Lift the tensioner until the up and down movement of the chain, measured at the centre of the upper run is, 5/8 - 7/8 in (0.63 - 0.88 mm). Tighten the bolt and then re-check the tension.
12 On electric start models, the starter motor must be refitted now to allow replacement of the clutch operating arm and adjustment of the clutch. Lubricate the starter secondary shaft bearing in the starter motor housing with grease. Place a new gasket over the starter motor retaining studs and then replace the oil seal holder plate with the raised edge facing the starter motor. Insert the starter driven gear into the housing attached to the front of the starter motor. Slide the starter motor into position so that the splines on the secondary shaft engage with those of the driven gear. Push the starter motor fully home on the studs and fit and tighten the two retaining nuts.
13 Refit the clutch operating arm onto the shaft which runs into the gearbox. By means of the adjuster, screw in the clutch pressure plate. Adjust the end play in the pushrod until the operating arm is approximately ½ in (12.7 mm) from the body of the starter motor. Tighten the locknut. Reconnect the control cable with the clutch arm and adjust the cable by means of the adjuster screw so that there is approximately ½ in (12.7 mm) movement at the ball end of the handlebar lever before clutch disengagement commences.
14 Fit a new gasket to the primary chaincase, after ensuring that the mating surfaces are absolutely clean. Replace the bronze washer on the end of the starter shaft and lubricate the primary drive chain with engine oil. Position the primary chain cover and fit the eight screws. Tighten the screws down evenly, a little at a time, in a diagonal sequence.
15 In order that the primary chaincase does not leak oil, and more importantly, so that the automatic oil feed and return system functions correctly, the primary chaincase must be perfectly airtight. Harley-Davidson recommend that the chaincase is tested with a vacuum gauge to check sealing. The vacuum should be 20 in of water or more, with the engine running at 1500 rpm and the breather pipe to the oil tank closed by pinching with a pair of pliers. This test is impracticable unless the correct equipment is at hand, and in any case should not be required, providing care has been taken in reassembly. A loss of vacuum, and therefore failure of the chaincase lubrication may be due to the following defects. Leakage at the alternator/chaincase 'O' ring. Damaged starter motor housing gasket or shaft 'O' ring. Damaged primary chaincase gasket. Leakage of air through chaincase bearing or between bearing inner race and the gearbox mainshaft.
16 The faults listed will not usually prevent a feed of oil to the chaincase, but will prevent proper scavenging of the lubricant and cause a rise in the level.

## 37 Completion of engine reassembly

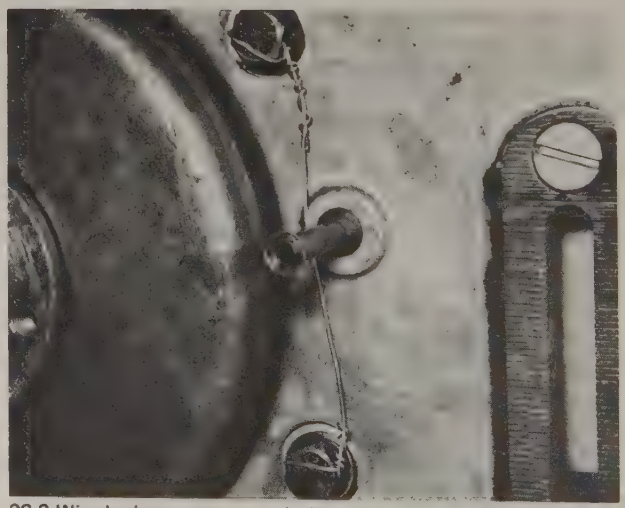
1 Grease the gearchange lever shaft and insert it in the pivot bracket from the inside. Reconnect the gearchange link arm



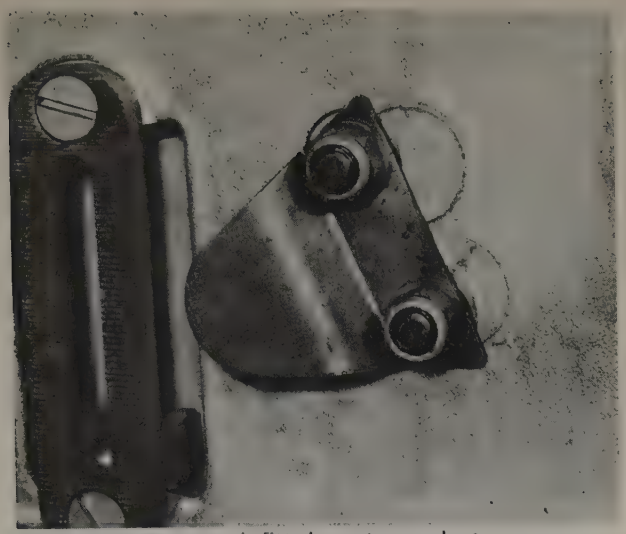
36.2a Fit a new 'O' ring to the crankcase spigot



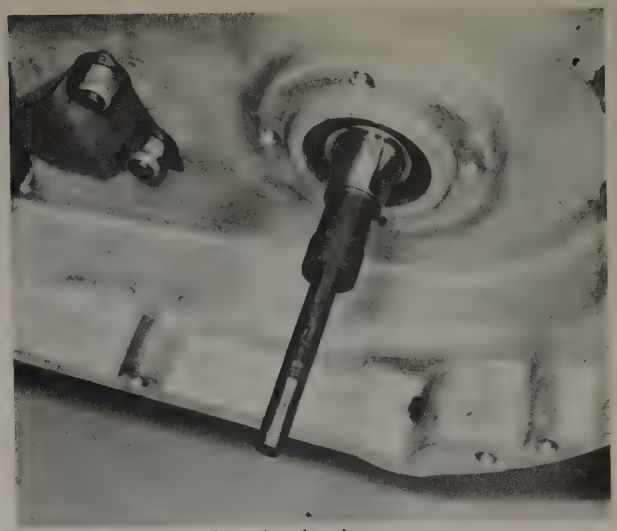
36.2b Place chaincase inner in position



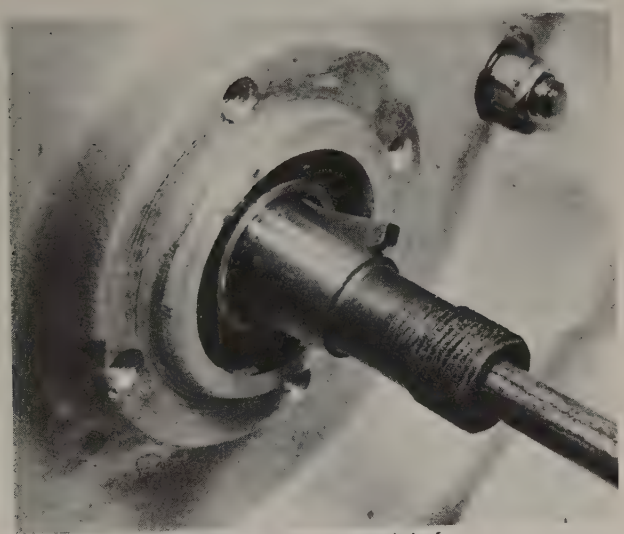
36.3 Wire-lock or secure two bolts with locking fluid



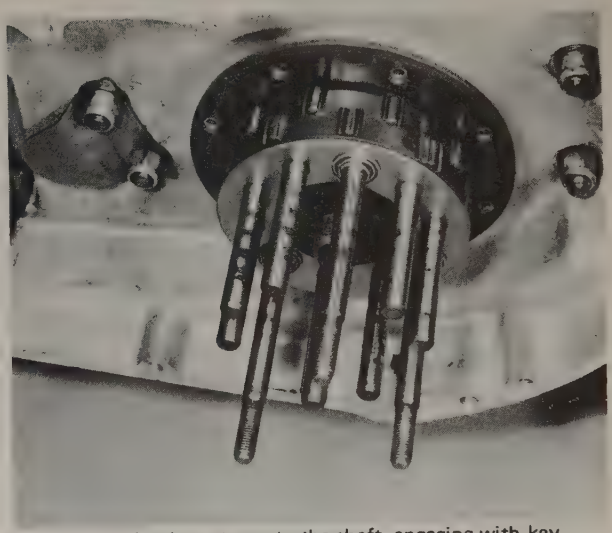
36.4 Oil breather cover is fitted over two washers



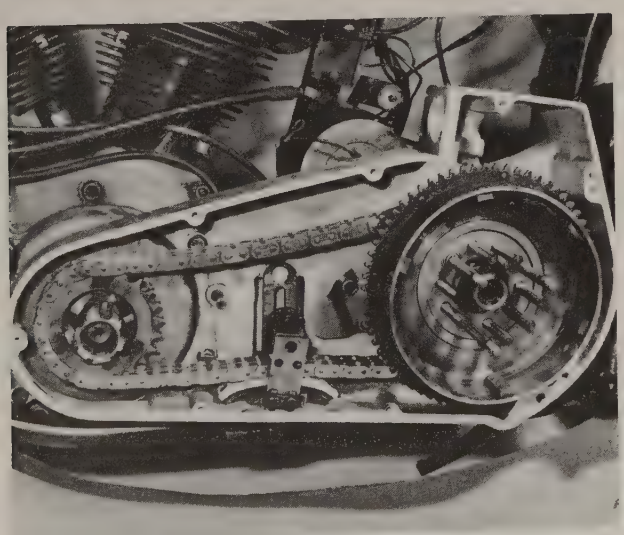
36.6a Insert the clutch pushrod and ...



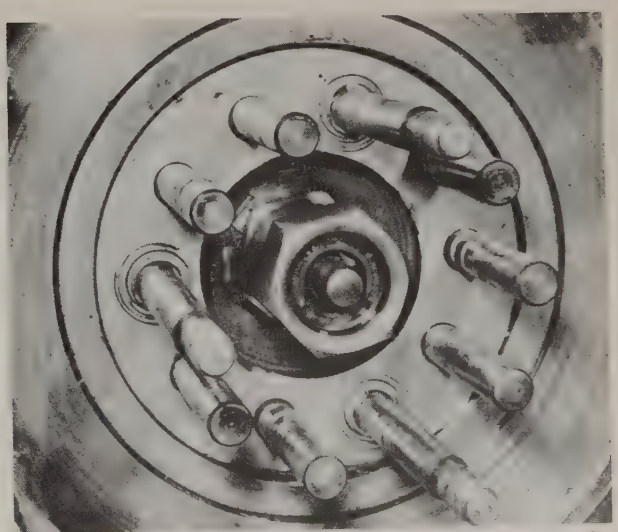
36.6b ... fit Woodruff key to the tapered shaft



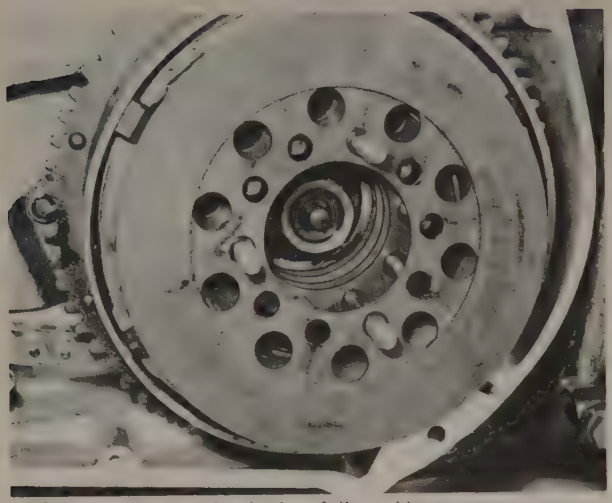
36.6c Place clutch centre onto the shaft, engaging with key



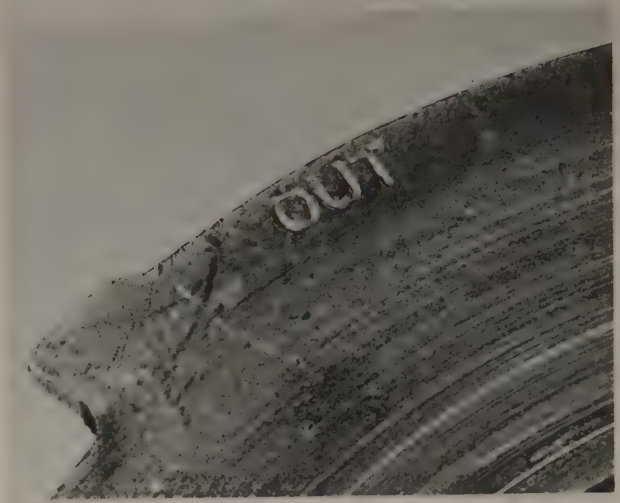
36.7 Fit primary drive unit as a sub-assembly



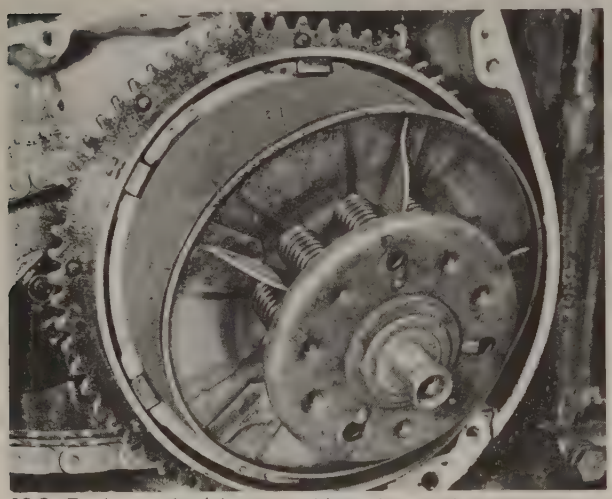
36.8a Replace centre nut (LH thread) and secure with tab washer



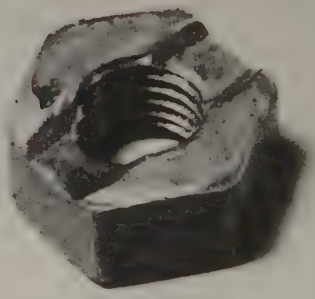
36.8b Insert friction clutch plate followed by ...



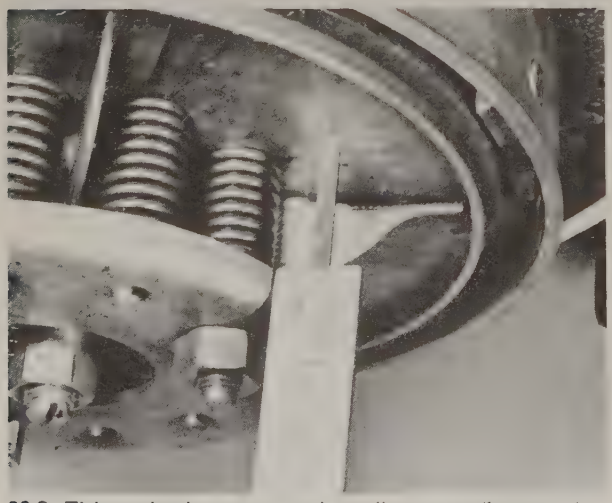

36.8c ... plain clutch plates. Note 'out' mark



36.9a Replace spring/plate assembly and secure by ...



36.9b ... refitting the adjuster nuts with indentations inwards



36.9c Tighten the three nuts evenly until correct adjustment is made

with the shaft arm and secure it by means of the circlip. Replace the pivot bracket cover and fit the gear lever to the shaft. Tighten the pinch bolt after checking that the operating angle is correct. If necessary, refit the footboard (where utilised), to enable the operating angle to be gauged. The footboard pivot bolts should be lubricated with graphite grease before refitting.

2 Secure the speedometer cable with the clip at the base of the cylinder barrels.

3 Carefully reconnect the main leads from the rectifier-regulator by pushing the socket into the plug in the crankcase. Reconnect the wires from the starter motor, battery and starter relay with the starter solenoid and fit the protective boot. Replace the ignition coil and connect the low tension leads to the terminals. Refit the chrome coil cover which is retained by nuts. Reconnect the HT leads with the spark plugs. It is immaterial which way round they are fitted.

4 Place a new gasket over the carburettor mounting studs and fit the carburettor to the induction manifold. On machines

fitted with a Keihin carburettor (1976 on) the gasket is substituted by an 'O' ring, which seats in a groove in the carburettor flange. If the 'O' ring is in poor condition or lies below the face of the flange, it must be renewed. On pre-1976 carburettors the upper carburettor stud retains the throttle cable anchor; on all models the lower stud holds a fuel feed hose guide clip. **Do not** overtighten the flange nuts or distortion will develop. Reconnect the choke cable by means of the screw nipple so that when the choke knob is fully out the choke butterfly valve is fully closed. Reconnect the throttle in a similar manner so that there is a small amount of free play before the throttle valve commences opening. On Keihin carburettors the throttle cable passes round a pulley attached to the throttle valve spindle.

5 Position the air filter backplate over the carburettor mouth and refit the three countersunk screws and the single bolt. Replace the air filter element followed by the cover held by two screws.

6 Reconnect all the oil pipes with the unions on the oil pump body. Refer to the photo if there is any doubt as to their correct positions. Secure the oil pipes with clips of the original design or screw clips. The aluminium clips utilised as standard require crimping with a special pair of pliers.

7 If the battery carrier was removed it should now be refitted. The carrier is supported by rubber mounted studs attached to lugs and a bracket attached to two of the gearbox upper end cover nuts. Reconnect the oil pressure warning switch lead to the switch at the oil pump and if detached, the brake switch leads. Reconnect also the starter motor lead at the terminal projecting from the motor, and the leads to the starter relay mounted below the carrier. Replace the battery and check that all wiring on the machine is correctly connected before attaching the main leads to the battery. Remember that the earth lead runs to the **negative (—)** terminal on the battery. Refit the battery cover (where utilised) and secure the battery by means of the strap.

8 Place a new exhaust gasket ring over each exhaust pipe flange stub. Position the exhaust pipes so that the pipe stubs can be inserted into their respective exhaust ports, either singly or simultaneously, depending on the type of exhaust system. Fit and tighten the single socket screw holding each flange. Replace the silencer support bolts, ensuring that any spacer collars are not omitted. Replace the chrome pipe guards (where utilised).

9 Fit the most forward right-hand footrest to the gearbox mounting studs, by means of the plate bracket. On FX models, note that the rear brake operating pushrod must be inserted in the master cylinder as the footrest is refitted. Refit the right-hand footboard, together with the left-hand one if this has not been done already. Grease the pivot bolts before inserting them and tightening the thin nuts.

10 Replace the seat unit (if removed) and the petrol tank or tank halves by reversing the dismantling procedure. On Super Glide models, do not omit the rubber saddle which supports the front of the tank. When fitting the two halves of the Electra Glide tank, remember to reconnect the two vent tubes to the unions at the upper front of the tank, and the cross-over tube at the lower unions. Reconnect the fuel line to the carburettor after passing the hose through the guide clip secured by the lower carburettor mounting stud.

11 Refill the oil tank with 4/3.33 US/Imp. quarts (1.90 litres) of the specified grade of oil. Do not overfill the tank in order to replenish with the recommended quantity. Wait until the engine has been run and the level has dropped and then pour in the remainder.

## 38 Starting and running the rebuilt engine

1 Before starting the engine after a rebuild, check that all the oil and petrol unions are tight, and that no electrical leads remain disconnected.

2 Open the petrol tap, and start the engine using either the kickstart or the electric starter. Keep the engine running at low speed for a few moments to permit the oil to circulate through the lubrication system. Check the oil return to the oil tank.

3 The engine may show a tendency to smoke initially due to the amount of oil used during assembly of the various components. This excess oil should gradually burn away as the engine settles down.

4 Check the exterior of the machine for oil leaks or blowing gaskets. Make sure each gear engages correctly and that all controls function effectively, particularly the brakes. This is an essential last check before taking the machine on the road.

5 As soon as the satisfactory running of the engine has been ascertained the ignition timing should be checked and if necessary, readjusted as described in Chapter 5, Section 6.

6 On initial starting the valve gear may be expected to be 'clattery'. This complaint will disappear as soon as the hydraulic tappets have built up pressure and self-adjusted.

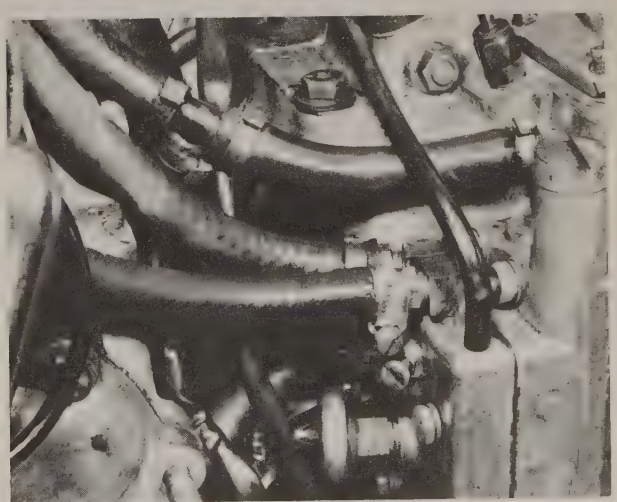
## 39 Taking the rebuilt machine on the road

1 Any rebuilt machine will need time to settle down, even if parts have been replaced in their original order. For this reason it is highly advisable to treat the machine gently for the first few miles to ensure oil has circulated throughout the lubrication system and that any new parts fitted have begun to bed down.

2 Even greater care is necessary if the engine has been rebored or if a new crankshaft has been fitted. In the case of a rebore, the engine will have to be run-in again, as if the machine were new. This means greater use of the gearbox and a restraining hand on the throttle until at least 500 miles has been covered. There is no point in keeping to any set speed limit; the main requirement is to keep a light loading on the engine and to gradually work up performance until the 500 mile mark is reached. These recommendations can be lessened to an extent when only a new crankshaft is fitted. Experience is the best guide since it is easy to tell when an engine is running freely.

3 If at any time a lubrication failure is suspected, stop the engine immediately and investigate the cause. If an engine is run without oil, even for a short period, irrepairable engine damage is inevitable.

4 When the engine has cooled down completely after the initial run, recheck the various settings, especially the valve clearances. During the run most of the engine components will have settled down into their normal working locations.



37.6 Oil pump connections - general view

**40 Fault diagnosis: engine**

| Symptom | Cause | Remedy |
|---|---|---|
| Engine will not turn over | Clutch slip (kickstart models) | Check and adjust clutch. |
| | Discharged battery (electric start models) | Check electrolyte level, recharge battery. |
| | Faulty starter motor or solenoid | See Chapter 8. |
| | Mechanical damage | Check whether valves are operating correctly and dismantle if necessary. |
| Engine turns over but will not start | No spark at plugs | Remove plugs and check. Check whether battery is discharged. |
| | No fuel reaching engine | Check fuel system. |
| | Too much fuel reaching engine | Check fuel system. Remove plugs and turn engine over several times before replacing. |
| Engine fires but runs unevenly | Ignition and/or fuel system fault | Check systems as though engine will not start. |
| | Burnt or sticking valves | Check for loss of compression. |
| | Blowing cylinder head gasket | See above. |
| Lack of power | Incorrect ignition timing | Check accuracy of setting. |
| | Valve timing not correct | Check timing mark alignment on timing pinions. |
| | Badly worn cylinder barrels and pistons | Fit new rings and pistons after rebore. |
| High oil consumption | Oil leaks from engine unit | Trace source of leak and rectify. |
| | Worn cylinder bores | See above. |
| | Worn valve guides | Renew guides. |
| Excessive mechanical noise | Failure of lubrication system | Stop engine and do not run until fault located and rectified. |
| | Worn cylinder barrels (piston slap) | Rebore and fit oversize pistons. |
| | Worn big-end bearings (knock) | Fit new big-end bearings. |
| | Worn main bearings (rumble) | Fit new bearings. |

# Chapter 2 Gearbox

**Contents**


General description ... 1
Operations with gearbox in the frame ... 2
Gearbox: removal from the frame ... 3
Gearbox dismantling: removing the gearshafts and gear clusters ... 4
Gearbox dismantling: removing the gear selector box and selector drum ... 5
Examination and renovation: gearshafts, pinions and bearings ... 6
Examination and renovation: gear selector mechanism ... 7
Examination and renovation: kickstart components and clutch release shaft ... 8
Gearbox reassembly: refitting the bearings, gearshafts and cluster ... 9
Gearbox reassembly: refitting the selector forks and selector mechanism ... 10
Fault diagnosis: gearbox ... 11


**Specifications**

## Gearbox

| | | | |
|---|---|---|---|
| Type | Four speed, constant mesh | | |
| Ratios: | | Engine sprocket | |
| | 23 tooth | 24 tooth | ** 22 tooth |
| FL and FLH | | | |
| 1st gear | 11.19 : 1 | 10.74 : 1 | 11.69 : 1 |
| 2nd gear | 6.79 : 1 | 6.50 : 1 | 7.09 : 1 |
| 3rd gear | 4.59 : 1 | 4.39 : 1 | 4.79 : 1 |
| 4th gear | 3.73 : 1 | 3.57 : 1 | 3.90 : 1 |
| * FX | | | |
| 1st gear | 10.71 : 1 | 10.25 : 1 | 11.20 : 1 |
| 2nd gear | 6.51 : 1 | 6.24 : 1 | 6.80 : 1 |
| 3rd gear | 4.40 : 1 | 4.21 : 1 | 4.60 : 1 |
| 4th gear | 3.97 : 1 | 3.42 : 1 | 3.73 : 1 |

** FX Models 1975 on were fitted with 1st gear ratios of 9.91 : 1, 9.48 : 1, and 10.33 : 1 for machines with 23 tooth, 24 tooth and 22 tooth engine sprockets respectively.*
*** Sidecar sprocket only.*

## Sprockets

| | |
|---|---|
| Engine | 23 or 24 tooth |
| Clutch | 37 tooth |
| Gearbox: | |
| FL and FLH | 22 tooth |
| FX | 23 tooth |
| Rear wheel | 51 tooth |

**Gearbox oil capacity** ... 1.5/1.2 US/Imp pt (0.7 litres)

## Tolerances and wear limits

| | |
|---|---|
| **Mainshaft** | |
| Drive side bearing radial play | 0.0005 - 0.002 in (0.012 - 0.050 mm) |
| Sleeve gear bush/shaft clearance | 0.002 - 0.003 in (0.050 - 0.076 mm) |
| 3rd gear endfloat | 0.000 (zero) - 0.017 in (zero - 0.43 mm) |
| 3rd gear bush/shaft clearance | 0.001 - 0.002 in (0.025 - 0.050 mm) |
| **Layshaft** | |
| Double gear bearing radial play (2) | 0.0005 - 0.002 in (0.012 - 0.050 mm) |
| Double gear endfloat | 0.007 - 0.012 in (0.177 - 0.30 mm) |
| 2nd gear endfloat | 0.003 - 0.017 in (0.076 - 0.43 mm) |
| 2nd gear bush/shaft clearance | 0.000 (zero) - 0.0015 in (zero - 0.038 mm) |

| | |
|---|---|
| 2nd gear bush/pinion clearance ... ... ... ... ... | 0.0005 - 0.0025 in (0.012 - 0.060 mm) |
| 1st gear bush/shaft clearance ... ... ... ... ... ... | 0.000 (zero) - 0.0015 in (zero - 0.038 mm) |
| 1st gear bush/pinion clearance ... ... ... ... ... ... | 0.0005 - 0.0025 in (0.012 - 0.060 mm) |
| Change drum endfloat ... ... ... ... ... ... ... | 0.0005 - 0.0065 in (0.012 - 0.165 mm) |

## 1 General description

1 The configuration of the engine and gearbox assemblies fitted to the range of 1200 cc machines is of the so-called 'pre-unit' type, where the gearbox is a remote assembly contained within its own aluminium casings and mounted aft of the engine. Power to the gearbox is transmitted via a multi-plate clutch and duplex roller chain, enclosed in a detachable chaincase on the left-hand side of the machine.
2 The selection of gears in the four-speed constant mesh gearbox is made by means of an externally mounted plunger box, interconnected by gear quadrant to a cam type drum which imparts movement to the selector forks. The forks control the movement of sliding dog clutches which engage with the face of each gear.
3 The mainshaft, to which is attached the clutch, is supported on a journal ball bearing at the right-hand end and by an uncaged needle roller bearing at the drive side end. The layshaft is of the fixed type, where all the gears are fully floating, being supported on uncaged needle roller bearings or plain bushes.
4 On FX models, only a kickstart mechanism is incorporated, operated by a traditional cranked lever from the right-hand side of the machine.

## 2 Operations with gearbox in the frame

1 Attention to the kickstart mechanism, such as renewal of the ratchet and pinion, can be carried out with the gearbox in situ, after removal of the outer cover. Renewal of the kickstart return spring may be carried out merely by detaching the kickstart lever and the spring cover plate.
2 Readjustment of the gear selector mechanism may be accomplished also without necessitating removal of the gearbox, but requires that the clutch, primary drive and primary chain case are first detached. The sequence for selection adjustment is described in the gearbox reassembly procedure, in Section 10 of this Chapter.

## 3 Gearbox: removal from the frame

1 The gearbox can be removed from the frame with the engine still in place, but after removal of the primary drive and clutch, the starter motor (where fitted) and the battery and battery carrier. Refer to the relevant details in Chapter 1. With these major components removed to allow access, continue as follows:
2 Remove the oil tank drain plug and allow all the oil to drain into a container of greater capacity than 4/3.33 US/Imp qts. Disconnect the oil tank breather pipe and the return pipe at the top of the tank, also the oil feed line from the union at the oil pump. The securing clips should be prised apart with the blade of a screwdriver and discarded. Remove the oil tank filler cap and the level dipstick. Loosen and remove the two nuts securing the oil tank to the rubber mounted support studs. Manoeuvre the oil tank off the studs and then remove the tank from the machine to the left-hand side.
3 Detach the forwardmost right-hand footrest complete with the mounting bracket. On Super Glide models, the footrest shaft also serves as the brake pedal pivot, and as such the brake operating pushrod must be withdrawn from the master cylinder as the assembly is removed.
4 Before disconnecting the final drive chain, knock down the tab washer ears securing the gearbox sprocket nut and loosen and remove the nut. Note that this nut has a left-hand thread and must be removed in a clockwise direction. Detach the rear chain by removing the spring link and then pull the gearbox sprocket off the splines.
5 Disconnect the neutral warning light lead at the switch on the forward wall of the gearbox. The switch wire terminal is a push fit cap which can be prised off carefully with the point of a small screwdriver. Detach the speedometer cable by unscrewing the gland nut at the gearbox housing.
6 Disconnect the clutch cable from the operating arm if this has not been done already.
7 The chaincase feed pipe is retained by a clip to the gearbox base plate. Either remove the bolt which holds the clip or detach the pipe at the oil pump union. Remove the four nuts and washers from the base of the gearbox and also the single bolt which passes through a frame lug on the left-hand side of the machine. The gearbox can now be lifted away as a complete unit.

## 4 Gearbox dismantling: removing the gearshafts and gear clusters

1 Place the gearbox over a suitable container and remove the drain plug to allow the 1.5/1.2 US/Imp pts to drain completely.
2 Remove all the countersunk screws from the gearbox top cover and also the special breather bolt, noting its location for future reassembly. The gearbox cover can now be lifted away, complete with the gear selector mechanism, and placed to one side for further attention.
3 Unscrew the nine nuts retaining the gearbox end cover and remove the battery carrier bracket. The cover is then free to be removed, complete with the kickstart shaft and spring (where fitted), also the clutch release shaft.
4 Pull the clutch release bearing from the end of the mainshaft. Place the gearbox so that the drive side end of the mainshaft is held securely in the jaws of a vice. It is important that the jaws are protected by aluminium sheet or wood blocks, to prevent damage to the shaft. Bend down the ear of the tab washer securing the end nut on the mainshaft and remove the nut and washer. The boss upon which the clutch release bearing fits, and which on kickstart models incorporates the kickstart ratchet, is a tight fit on the tapered shaft end, and will require pulling from position. A two or three legged sprocket puller may be utilised with ease. When fitting the puller, place a short bolt in the hollow mainshaft end to take the thrust of the puller screw. After the boss has been removed, the kickstart ratchet pinion, engagement spring and bush can be pulled off the shaft (kickstart models). Prise the one or two Woodruff keys from the mainshaft end and place them in a safe place, to prevent loss.
5 The shaft upon which the gear selector forks slide is a push fit in the casing, retained by a grub screw which passes through the top mating surface of the casing. Remove the grub screw and carefully lift the shaft from place. Note the 'O' ring in the groove at the left-hand end of the shaft. Take care not to lose the selector fork rollers, which are a light fit on the fork pins.
6 Unscrew the four screws holding the mainshaft bearing end plate to the inside wall of the gearbox outer compartment. The screws are very tight and may require the use of an impact driver to loosen them. Lift the retainer plate away. Loosen and remove the layshaft end nut after knocking down the tab washer. Remove the tab washer and also the specially shaped backing washer. Remove the single screw passing through the speedometer driveshaft housing flange and pull the complete assembly from place.
7 Carefully drift out the layshaft, using a soft drift. Slide the needle roller bearing spacer washer from between the layshaft 1st gear pinion and the right-hand gearbox wall. The complete layshaft gear cluster assembly may be lifted from the gearbox case as a unit. Note that an uncaged needle roller bearing is fitted into each end of the layshaft double gear. Take care that the needles do not fall out, or if this happens, that the needles from one bearing do not become intermixed with those from the

other. If loss or interchange of the 22 rollers in each bearing does occur, the two bearings must be renewed. After lifting the layshaft clusters from position, remove the needle rollers and store them separately.

9 Using a rawhide mallet or a block of wood to protect the shaft end and a hammer drift the mainshaft from the left-hand, until the ball-bearing or the bearing complete with the housing just clears the large opening in the right-hand gearbox wall. Using any suitable sharp instrument, prise the circlip from the shaft groove between the top gear sleeve pinion and the mainshaft 3rd gear pinion. Withdraw the mainshaft complete with the bearing and mainshaft double gear, while at the same time moving the circlip along the shaft. Lift the mainshaft 3rd gear pinion and the sliding dog clutch from the gearbox. Note that the dog clutch is fitted with the face stamped HIGH towards the top gear sleeve pinion.

10 Push the top gear sleeve pinion into the case and remove it from the top. The sleeve pinion runs on an uncaged needle roller bearing having 44 rollers. Remove the thrust washer from the bearing (if not already removed) and remove the 44 rollers, storing them in a safe place for reuse. Note the 'L' shaped key which engages with the sleeve pinion splines and the keyway in the oil seal spacer.

**5 Gearbox dismantling: removing the gear selector box and selector drum**

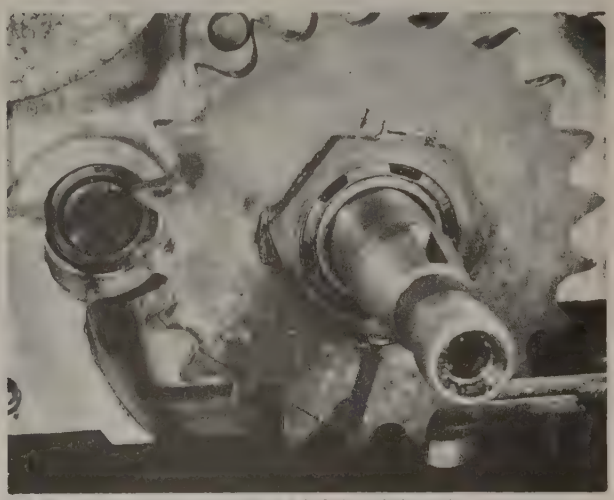
1 Remove the three countersunk screws from the selector arm plate and detach the plate. Unscrew the five countersunk screws, each of which is retained by a nut and lift the box body from place. The plate in the centre of the selector box carries two spring loaded plungers, and when pulled from position will release the plungers, together with two centraliser springs which may fly out if care is not exercised. Remove the central screw holding the back plate and lift the plate away from the gearbox cover.

2 Remove the neutral indicator switch followed by the gear selector detent housing, spring and plunger. The detent housing is secured by a tab washer, the ear of which should be bent down to release the housing hexagonal head.

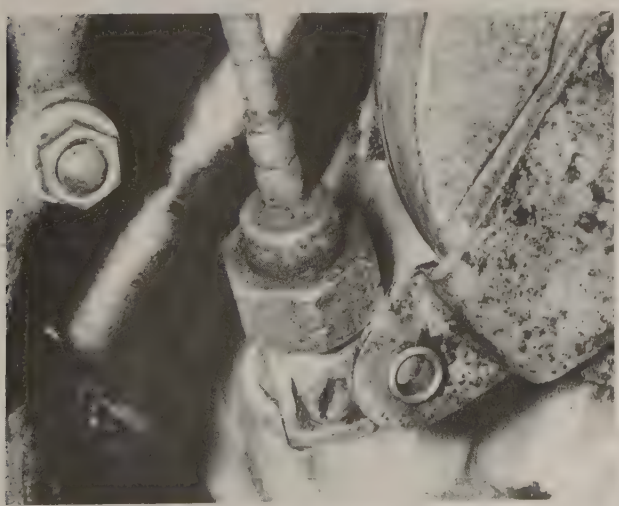
3 The shaft upon which the selector cam drum rotates is retained in a similar manner to that of the selector fork shaft. Remove the shaft grub screw and pull the shaft from place by grasping the projecting head with a pair of pliers. The change drum will lift out.

4 Removal of the selector drivegear shaft is not required,

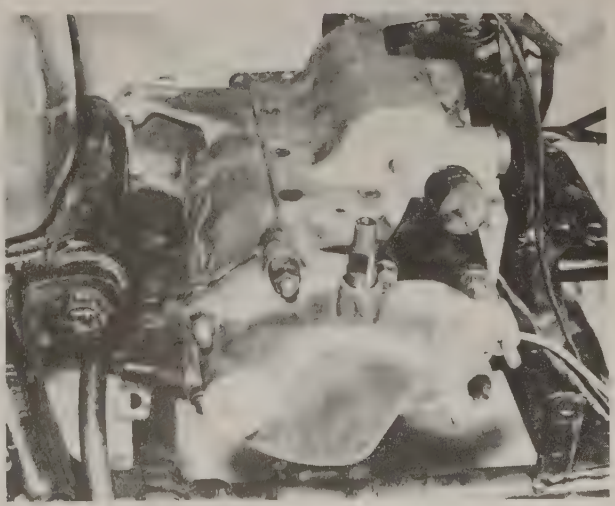
3.2 Oil tank supported on two similar rubber mounted studs



3.4 Gearbox sprocket nut has a left-hand thread



3.5 Speedometer cable (FL/FLH) is retained by gland nut



3.7 Gearbox - general view

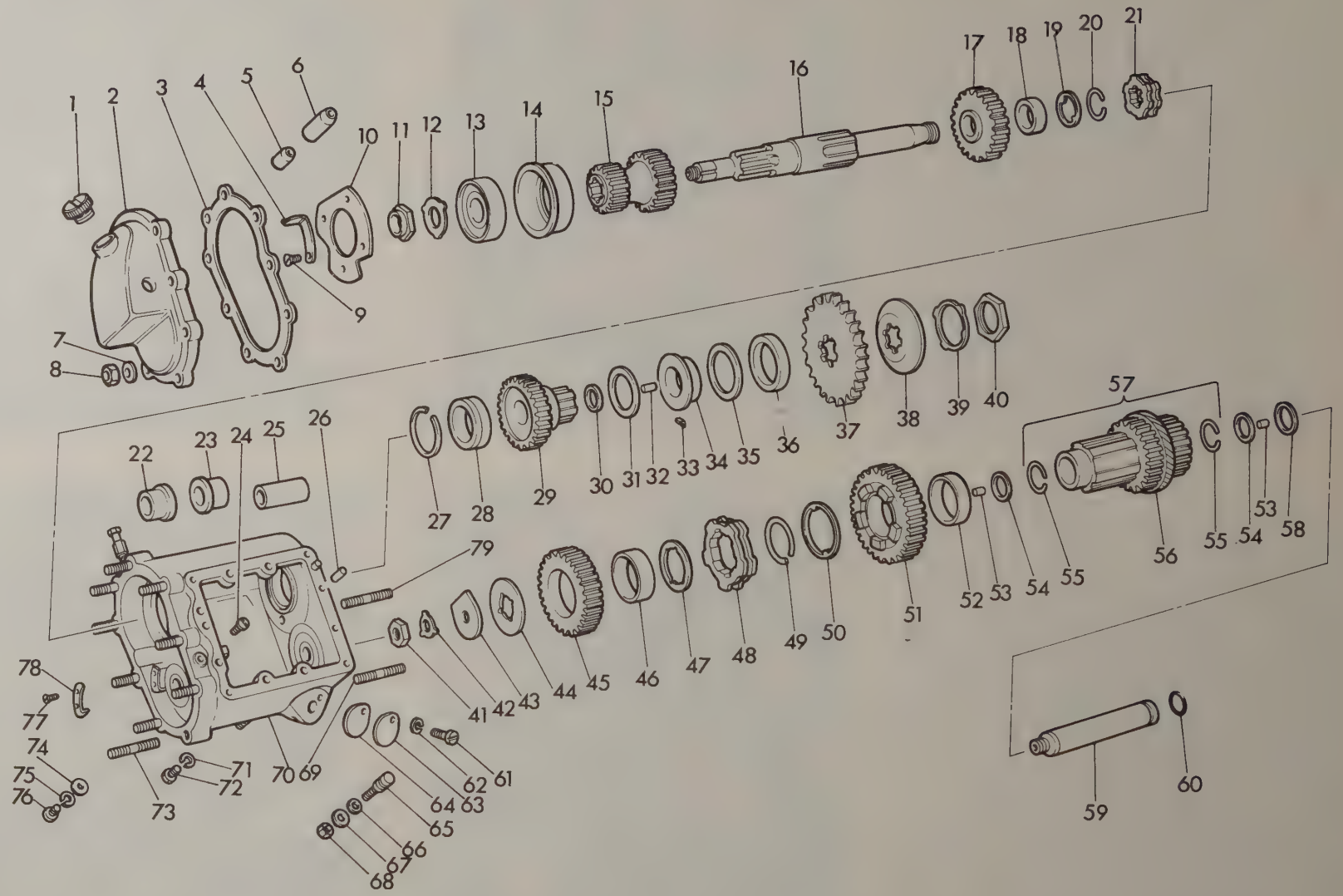



Fig. 2.1. Gearbox - component parts

**Fig. 2.1. Gearbox - component parts**

1 Oil filler cap
2 End cover
3 Gasket
4 Oil deflector - not fitted
5 Clutch shaft lower bush
6 Clutch shaft - upper bush
7 Plain washer - 4 off
8 Nut - 9 off
9 Screw - 4 off
10 Bearing retainer plate
11 Sleeve nut
12 Tab washer
13 Journal ball bearing
14 Bearing sleeve
15 Mainshaft double gear
16 Mainshaft
17 Mainshaft 3rd gear pinion
18 Bush
19 Spacer
20 Circlip
21 Sliding dog clutch
22 Layshaft bush
23 Layshaft bush
24 Breather screw
25 Sleeve pinion bush
26 Dowel - 2 off
27 Circlip
28 Sleeve gear bearing outer race
29 Mainshaft sleeve pinion
30 'O' ring
31 Roller backing plate
32 Roller - 44 off
33 Drive key
34 Oil seal collar
35 Cork seal
36 Oil seal
37 Final drive sprocket
38 Oil deflector plate
39 Tab washer
40 Nut
41 Nut
42 Tab washer
43 Special washer
44 Roller backing washer
45 Layshaft 1st gear pinion
46 Bush
47 Spacer
48 Sliding dog clutch
49 Circlip
50 Spacer
51 Layshaft 2nd gear pinion
52 Bush
53 Roller - 22 + 22 off
54 Roller backing washer - 2 off
55 Circlip - 2 off
56 Speedometer drive gear
57 Layshaft double gear
58 Roller backing washer
59 Layshaft
60 'O' ring
61 Screw - FX only
62 Spring washer - FX only
63 Speedometer drive blanking plate - FX only
64 Gasket - FX only
65 Stud - 4 off
66 Plain washer - 4 off
67 Spring washer - 4 off
68 Nut - 4 off
69 Stud - 2 off
70 Gearbox casing
71 Spring washer
72 Bolt
73 Stud - 9 off
74 Plain washer
75 Spring washer
76 Bolt
77 Screw - 2 off
78 Kickstarter quadrant stop

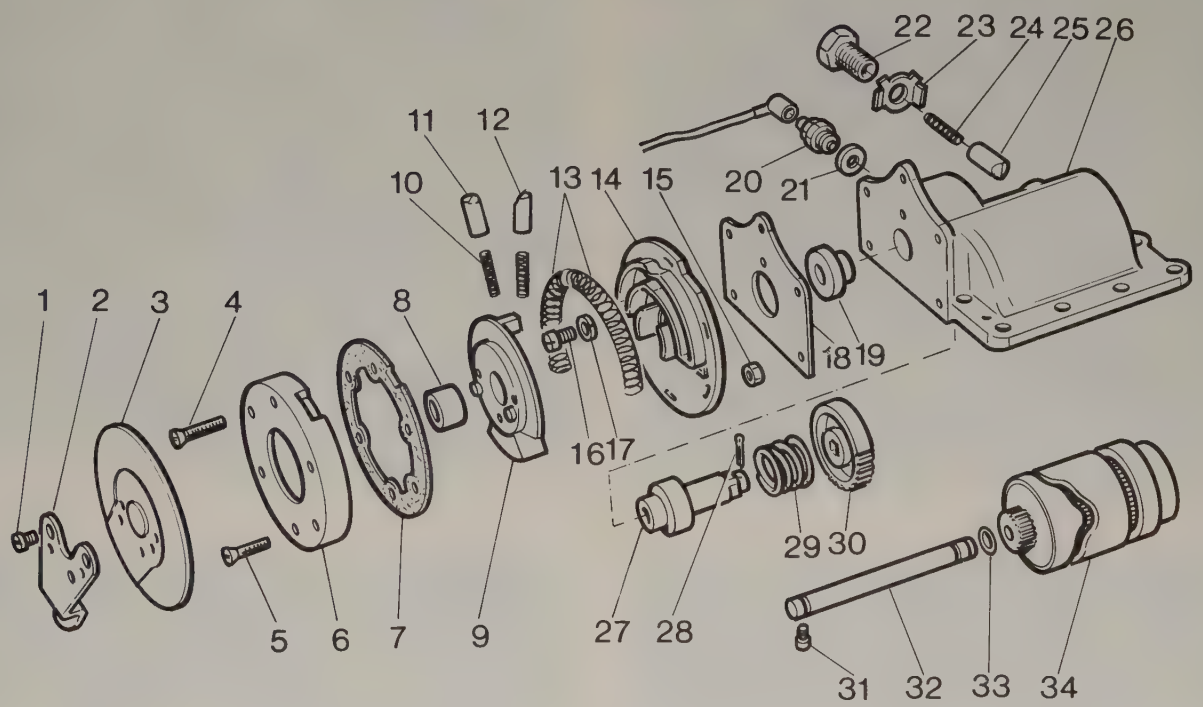
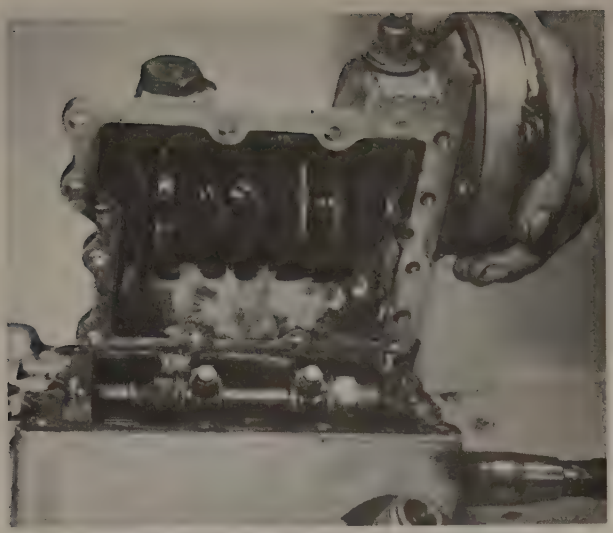
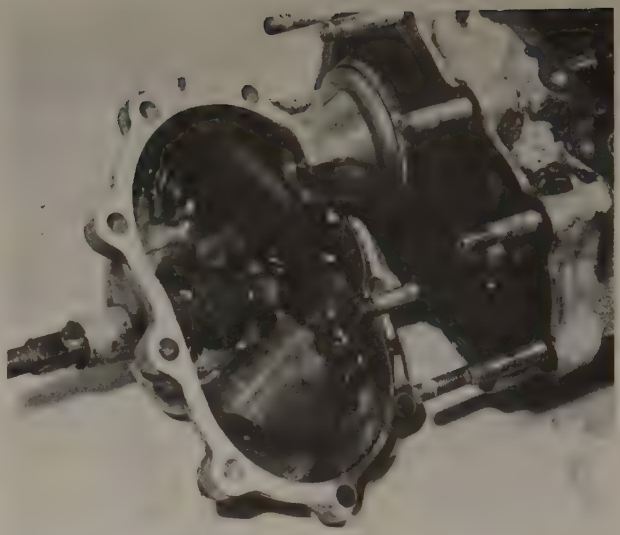



**Fig. 2.2. Gear selector box - component parts**

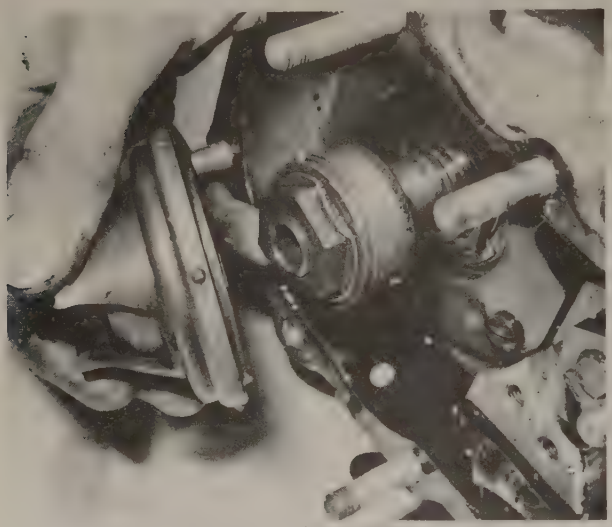
1 Countersunk screw - 3 off
2 Selector arm
3 Cover
4 Screw, long - 5 off
5 Screw, short
6 Selector box body
7 Gasket
8 Bush
9 Pawl carrier
10 Detent spring - 2 off
11 Change plunger - LH
12 Change plunger - RH
13 Centraliser spring - 2 off
14 Backplate
15 Nut - 6 off
16 Lock screw
17 Lockwasher
18 Gasket
19 Bush
20 Neutral indicator switch
21 Sealing washer
22 Detent housing
23 Tab washer
24 Detent spring
25 Engagement plunger
26 Gearbox top cover
27 Selector shaft
28 Split pin
29 Coil spring
30 Selector quadrant
31 Grub screw
32 Change drum spindle
33 'O' ring
34 Change drum



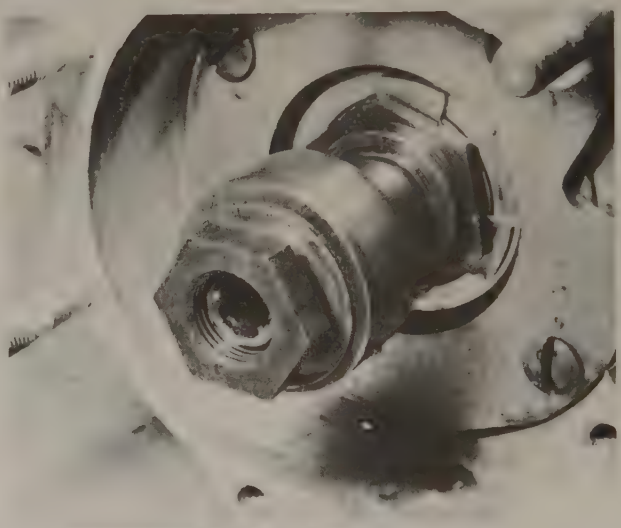
4.2 Lift off top cover complete with selector mechanism



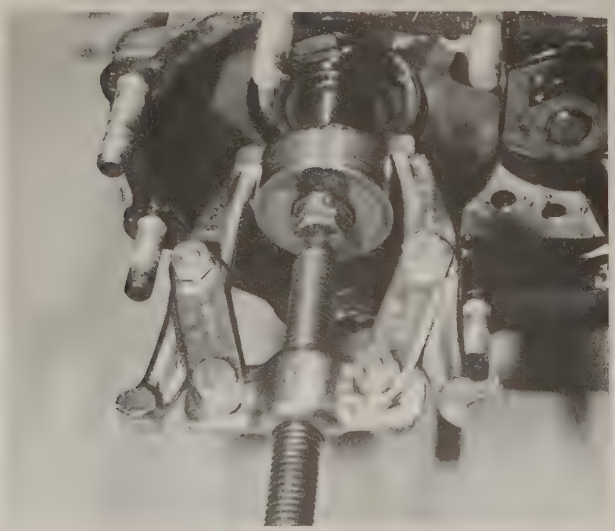
4.3 End cover held by nine nuts on studs



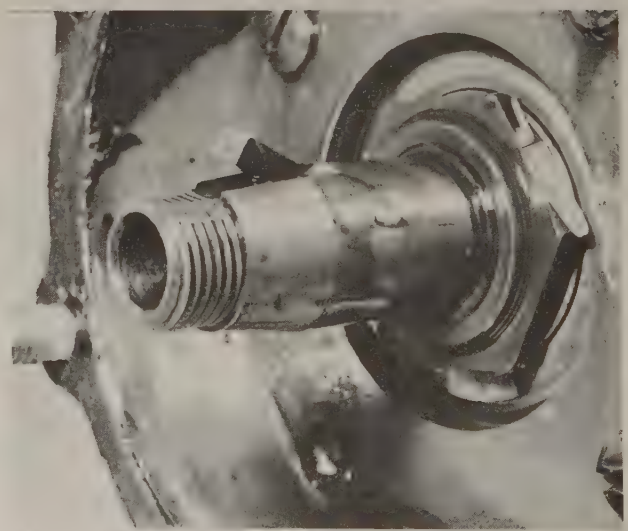
4.4a Pull clutch release bearing from position



4.4b Unscrew mainshaft end nut and ...

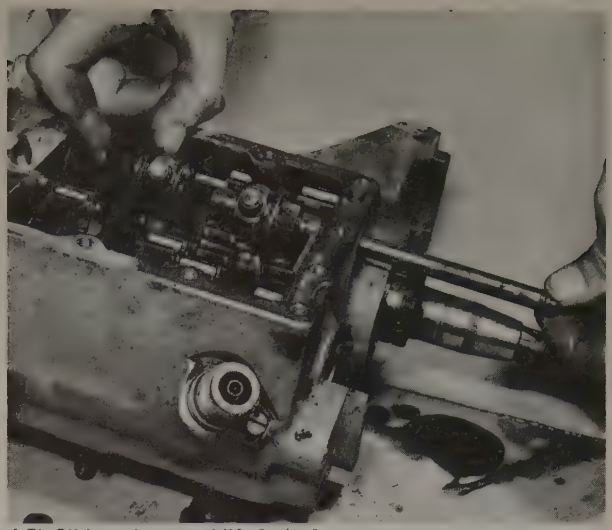


4.4c ... extract bearing boss; note bolt fitted to mainshaft end

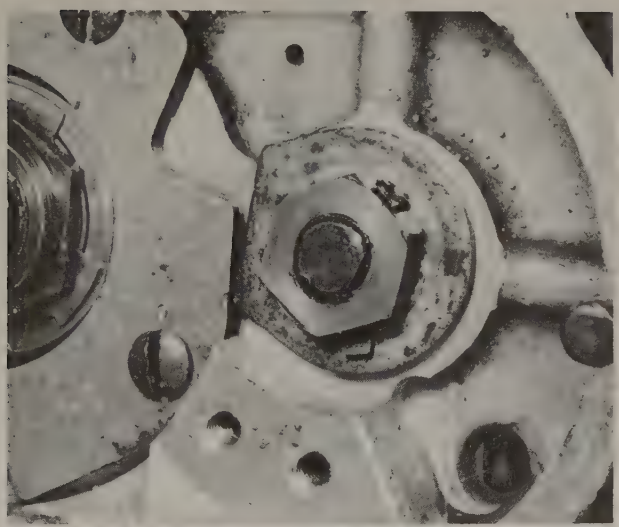


4.4d Prise Woodruff key from mainshaft end

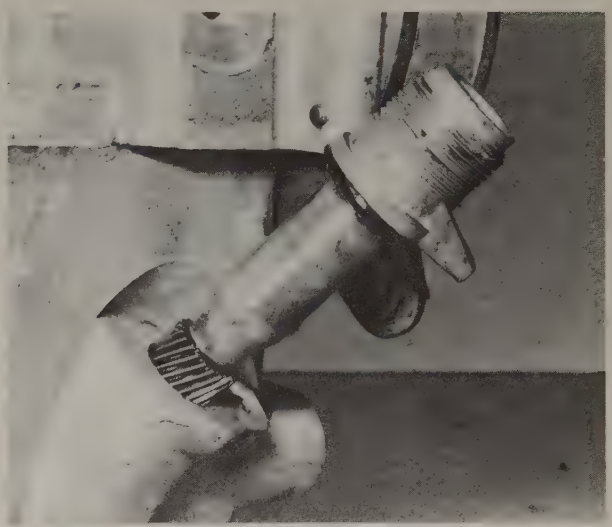
4.5a Selector fork rod retained by a grub screw



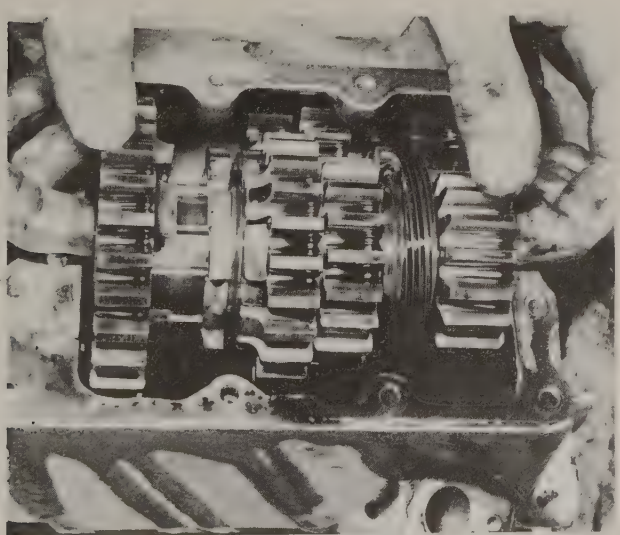
4.5b Slide rod out and lift forks from position



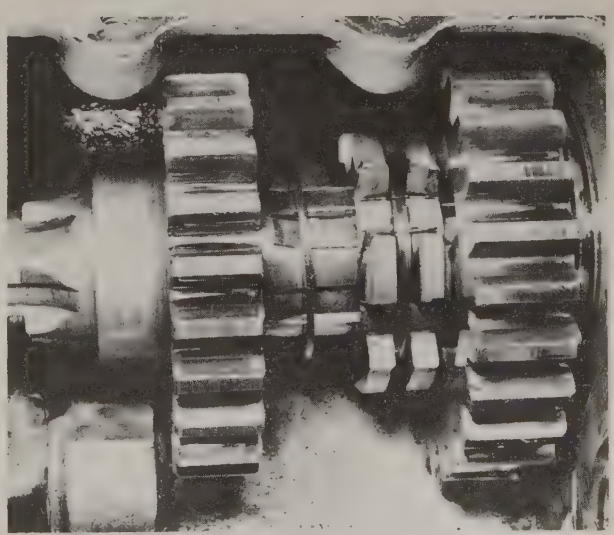
4.6a Knock down tab washer and remove nut, washer end plate



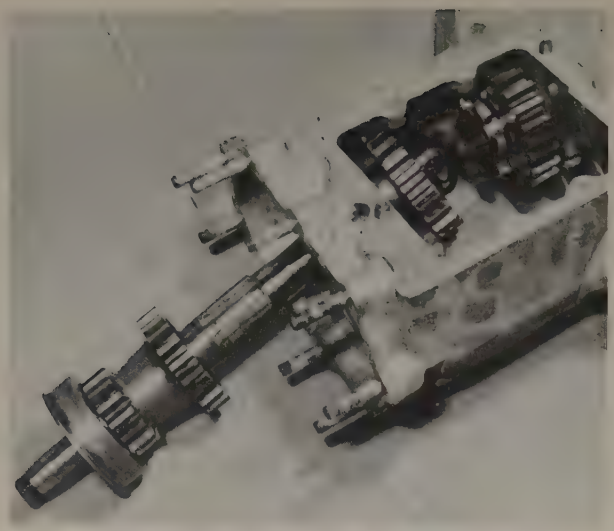
4.6b Speedometer drive is held by a single screw



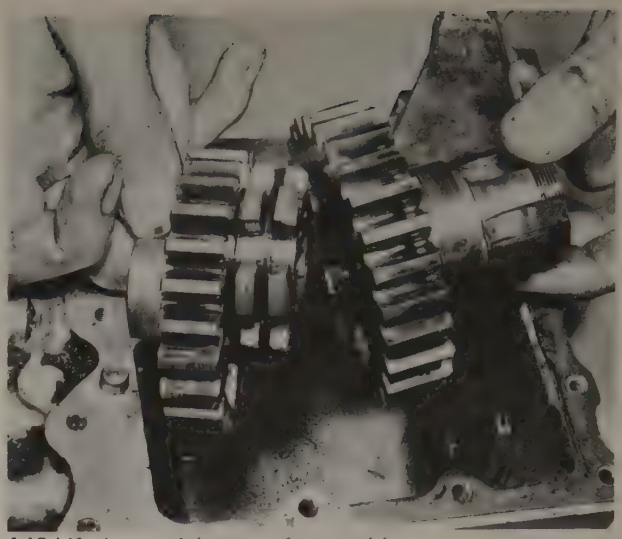
4.7 Lift layshaft assembly out as a complete unit



4.9a Move circlip out of groove towards the right and ...



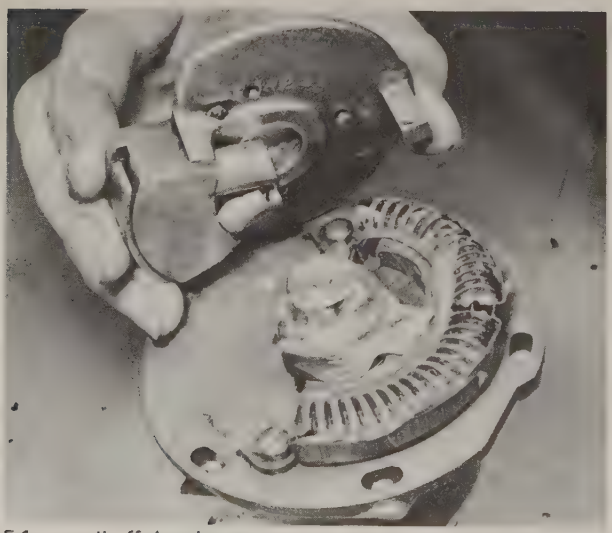
4.9b ... pull out mainshaft, double gear and bearing



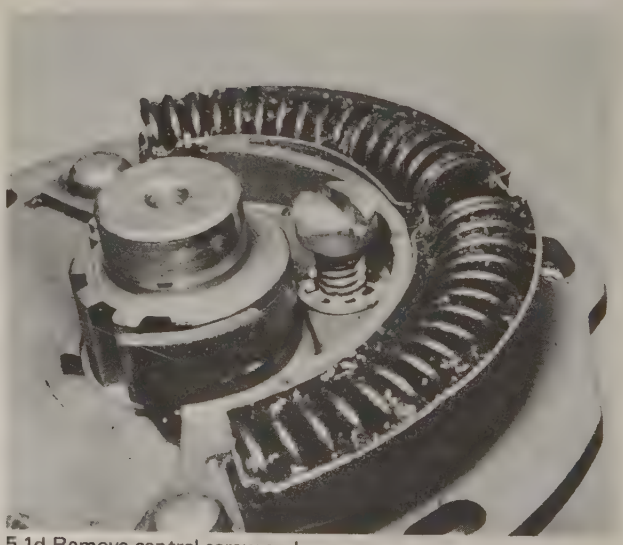
4.10 Lift the remaining gears from position

5.1a Selector arm plate is held by three screws

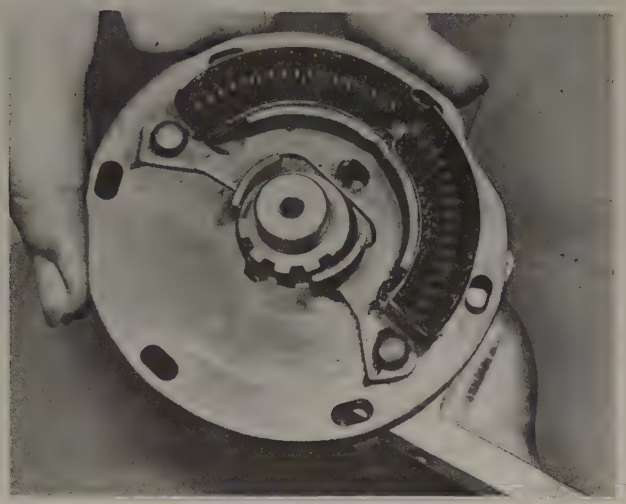
5.1b Lift off selector body held by nuts and bolts and ...



5.1c ... pull off the plunger corner plate



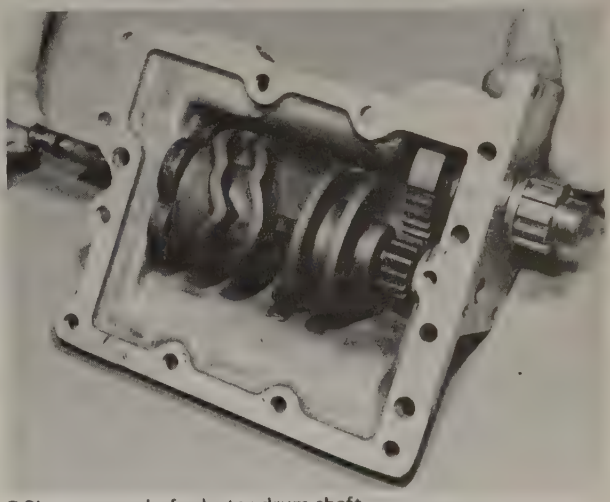
5.1d Remove central screw and ...



5.1e ... detach the backing spring plate

5.2 Detent plunger housing is secured by tab washer

5.3a Remove grub screw from top cover to allow ...



5.3b ... removal of selector drum shaft

unless wear of the shaft bush has occurred. To remove the shaft, pull out the split pin securing the selector quadrant and pull the shaft out, leaving the quadrant and backing spring in the cover. These two remaining components will lift out.

5.4 Selector quadrant is retained by split pin

## 6 Examination and renovation: gearshafts, pinions and bearings

1 Give the gearbox components a close visual examination for signs of wear or damage such as chipped or broken teeth, worn dogs or worn splines and bent selector arms. If the machine has shown a tendency to jump out of gear, look especially for worn dogs on the back of the gear pinions and similar wear with the projections on the dog clutches with which they engage. Check also for wear in the selector tracks of the change drum, and the camplate with which the detent plunger locates. In the former case, wear will be evident in the form of rounded corners or even a wedge-shaped profile in an extreme case. The corners of the cam plate tracks will wear first; all such wear is characterised by the brightly polished surface.

2 The selector arms usually wear across the fork that engages with a gear pinion, causing a certain amount of sloppiness in the gear change movement. A bent selector will immediately be obvious, especially if overheating has blued the surface.

3 All gearbox components that prove faulty will have to be renewed. There is no satisfactory method of reclaiming them.

4 Do not omit to check the gearbox mainshaft and layshaft. If it is suspected they are bent, the gear cluster must be stripped

down and the shafts checked with a dial gauge. Neither should be more than 0.003 inch out of true. If this reading is exceeded, the shaft concerned must be renewed.

5 After thorough cleaning in petrol, check the mainshaft journal ball bearing for radial play or roughness, when rotated. An indication of either fault will necessitate a new bearing. Removal of the bearing from the mainshaft can take place after the retaining nut has been unscrewed.

6 The two layshaft, and single mainshaft needle roller bearings require a small amount of running clearance, as shown in the Specifications. If additional play is evident, the bearings must be renewed. With the exception of the mainshaft needle roller bearing, whose outer race is a drive fit in the gearbox casing, the needle rollers run directly upon the components which they support and upon which they rotate. If bearing wear is very advanced, damage may have occured to the roller tracks on the components, necessitating renewal. The sleeve pinion bearing outer race may be driven or pressed from the casing, after removing the oil seal and oil seal collar and the retaining circlip. The casing MUST be heated in an oven to approximately 300°F before the race is drifted out. Refitting of the race should be carried out in a similar manner.

7 The clearance between the gear pinions, plain bushes and shafts should be checked against the Specifications at the beginning of the Chapter. Renew any bushes which are above the maximum clearance.

8 In common with the engine drive side mainbearings and the big-end bearings, oversize rollers are available to enable a selective fit between the components to be made. It is recommended, however, that renewal of bushes and bearings be carried out by a Harley-Davidson specialist who will have the necessary expertise and the correct instruments for the measurement of bearing play and bearing selection.

## 7 Examination and renovation: gear selector mechanism

1 Except in extreme cases little wear will develop in the selector components within the gearbox itself, other than that already discussed in the previous Section. After considerable service, the gear selector quadrant teeth and the teeth with which they mesh on the change drum may become worn, necessitating renewal of both components.

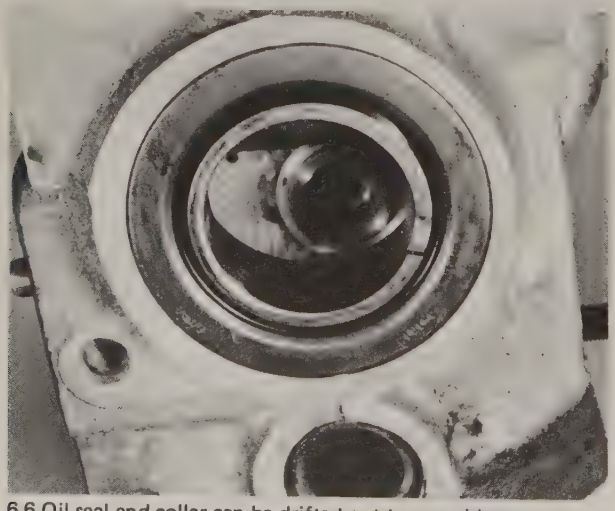
2 The bronze bush through which the selector shaft passes and the bush upon which the plunger carrier rotates may also wear after an extended period of use. The pawl carrier bush can be driven out, using a tubular drift. The shouldered bush in the gearbox cover must be drawn from position because access is obscured by the shape of the casting. A simple puller can be fabricated from a length of tubing slightly wider than the bush, a long threaded bolt and nut, and two washers, one of which must be slotted and have a diameter slightly less than the smaller external diameter of the bush.

Insert the bolt, head first through the bush and slip the slotted washer over the bolt, from the inside of the casing, to secure the bolt head. Fit the tubing over the bolt shank, followed by the second washer and the nut. The bush will be drawn from position when the nut is tightened down. Before attempting to remove the bush, the case must be heated to approximately 300°F in an oven.

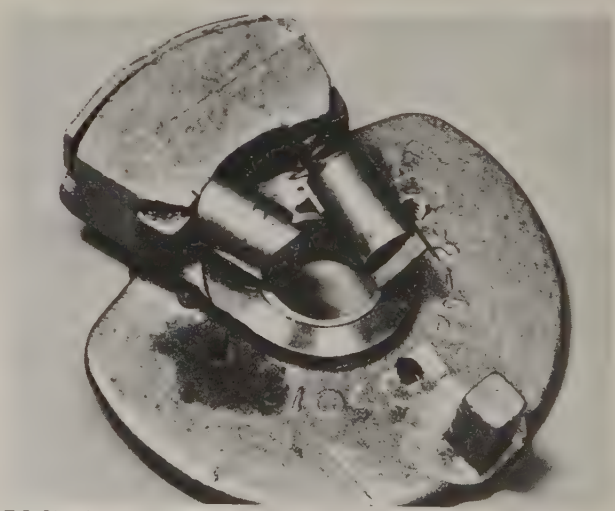
3 Inspect the tips of the two selector plungers and also the cam detent plunger. In order that the plungers function correctly, the tips must be fairly sharp. Worn components must be renewed.

4 Check the pawl return springs and the carrier centraliser springs for distortion or apparent weakening, renewing any suspect components as a pair.

6.5 Mainshaft ball bearing is housed in steel sleeve



6.6 Oil seal and collar can be drifted out from inside



7.3 Check detent plungers for worn tips

### 8 Examination and renovation: kickstart components and clutch release shaft

1 After removal of the gearbox end cover no further dismantling is required to ascertain the condition of the various components. Apart from sudden failure of the kickstart return spring, the main area of wear occurs in the teeth of the kickstart gear and ratchet pinion, and the teeth of the ratchet components. The latter type of wear will induce slipping. Worn teeth cannot be reprofiled; the only remedy is renewal of the parts in question. The ratchet pinion is fitted with a plain bush which may be drifted from position if excessive play dictates the need for renewal.

2 To remove the kickstart spindle, undo the end nut after bending down the tab washer. Using a rawhide mallet, drift the spindle from position, in so doing driving the kickstart gear off the shaft. As the spindle is withdrawn, the return spring will disengage automatically from the spindle. The spring can be removed after detaching the chrome cover, which is held by a single screw. Check the fit of the spindle in the two plain bushes. If wear is evident, the bushes may be drifted from place and new components fitted. An oil seal is fitted between the two bushes. This must be renewed if the bushes are displaced, and in any case if oil leakage has occurred along the spindle.

3 Reassemble the kickstart assembly as follows: Place the return spring in position with the thrust washer between the spring and casing. The chamfered side of the thrust washer should face the spring. Lubricate the spindle and insert it through the bushes, locating the inner end of the spring in the slotted spindle boss. Place the spindle end in the soft jaws of a vice and rotate the cover approximately 1 turn in a clockwise direction, to tension the spring. Fit the kickstart gear so that the spindle is prevented from unwinding. Fit the tab washer and nut, bending the tab washer up to secure the nut, after tightening.

4 In due course the clutch shaft bushes will wear, causing excessive movement at the shaft. To remove the shaft, detach the circlip from inside the casing and pull the shaft from place, leaving the release lever and thrust washer in the case. Displace the two latter components. The old bushes can be drifted out and new components fitted.

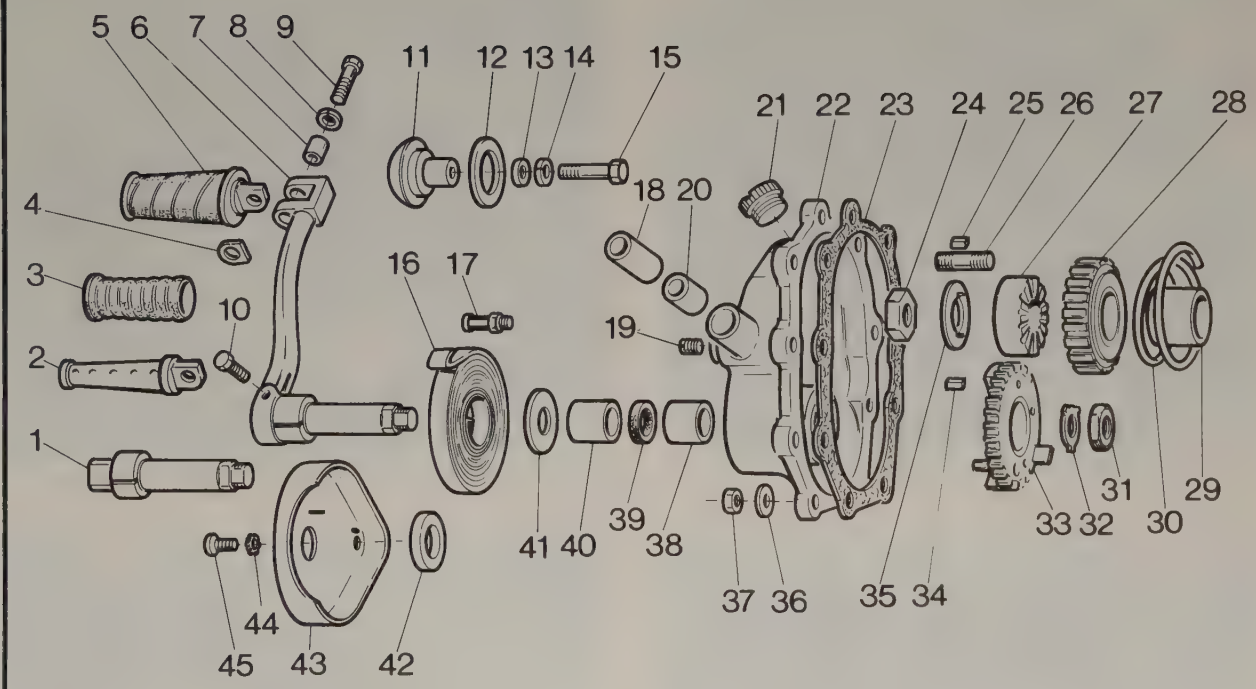
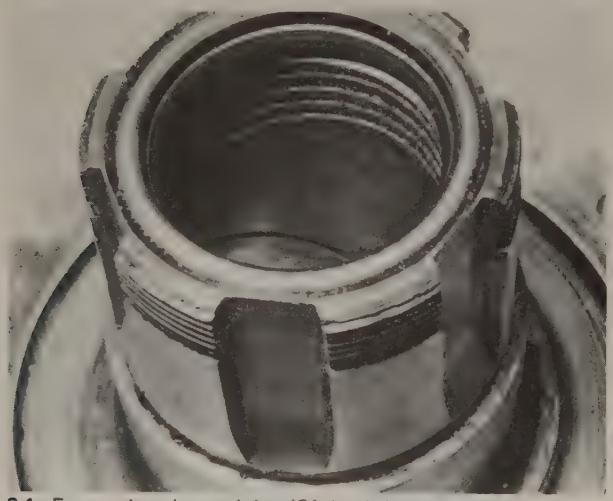



**Fig. 2.3. Kickstart components**

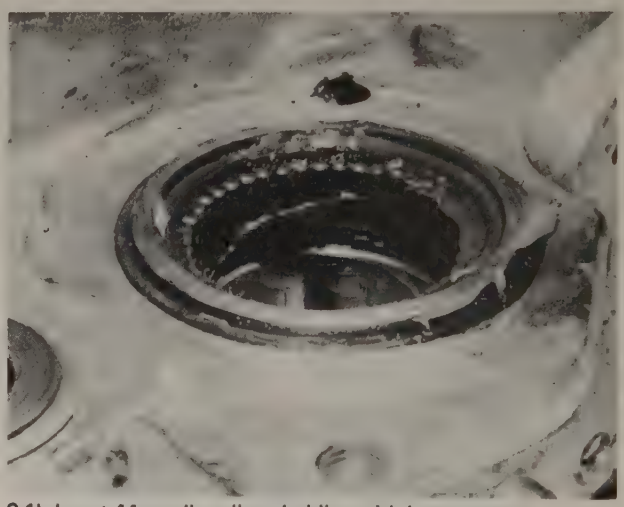
1 *Kickstart shaft*
2 *Kickstart pedal*
3 *Rubber*
4 *Shim*
5 *Kickstart pedal - complete*
6 *Kickstart crank*
7 *Bush*
8 *Washer*
9 *Bolt*
10 *Pinch bolt*
11 *Blanking cap*
12 *Seal*
13 *Plain washer*
14 *Spring washer*
15 *Bolt*
16 *Return spring*
17 *Spring anchor*
18 *Clutch shaft upper bush*
19 *Grub screw*
20 *Clutch shaft lower bush*
21 *Filler cap*
22 *Gearbox end cover*
23 *Gasket*
24 *Nut*
25 *Key - 1 off or 2 off*
26 *Stud - 9 off*
27 *Kickstart ratchet*
28 *Kickstart pinion*
29 *Bush*
30 *Tension spring*
31 *Nut*
32 *Washer*
33 *Kickstart quadrant*
34 *Key*
35 *Tab washer*
36 *Washer - 9 off*
37 *Nut - 9 off*
38 *Bush*
39 *Oil seal*
40 *Bush*
41 *Thrust washer*
42 *Spring cover insert*
43 *Spring cover*
44 *Washer*
45 *Screw*

**9 Gearbox reassembly: refitting the bearings, gearshafts and clusters**

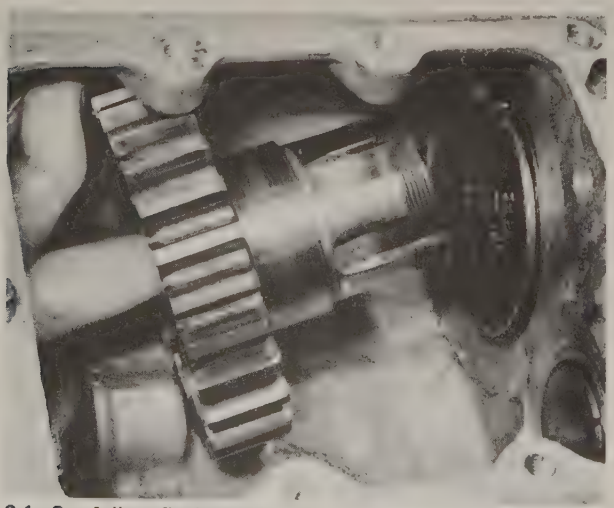
1 Place the 44 needle rollers in the sleeve pinion race and carefully slide the top gear sleeve pinion into position. Do not omit the bearing keeper washer which fits on the sleeve pinion boss. The rollers can be kept in place with a heavy grease.
2 Fit the mainshaft double gear to the splines on the shaft and then replace the journal ball bearing, tab washer and securing nut. Tighten the nut and bend up the tab washer to secure the nut. Insert the partially assembled mainshaft into the gearbox until the 3rd gear pinion, thrust washer, circlip and the sliding dog clutch can be fitted to the shaft, from the inside of the casing. Slide the circlip along the shaft until it seats correctly in its groove. The sliding dog must be fitted with the face marked *HIGH* towards the sleeve pinion. Using a rawhide mallet, carefully drift the mainshaft into place, until the shoulder of the bearing housing is hard up against the casing. Position the bearing retaining plate so the V-shaped cutout is towards the right-hand side of the shaft. Replace the four countersunk screws and where utilised, the oil deflector plate. Tighten the screws fully.
4 Reassemble the layshaft pinions in the sequence shown in the relevant photographs. Fit the two sets of 22 needle rollers, one in each end of the layshaft sleeve gear. Use grease to retain the rollers.
5 Lift the complete layshaft assembly into the gearbox, taking care not to dislodge any rollers. Slip the smaller layshaft cluster thrust washer between the 1st gear pinion and the casing wall and insert the layshaft. Insert the large thrust washer at the opposite end of the gearbox and push the layshaft fully home.
6 Fit the special backing washer to the layshaft end, followed by the tab washer and nut. Tighten the nut and secure it by bending up the tab washer. Fit the layshaft cover plate.
7 If the oil seal was removed, it should now be refitted. First clean up the casing, using a small file where the old oil seal was staked in place. Position a new cork gasket over the top gear sleeve. Grease the oil seal lip and insert the oil seal collar so that the spring side of the seal is towards the collar flange. Fit the two components over the top gear sleeve. The oil seal must be drifted into place, until the shoulder of the bearing housing is hard up against the casing. Position the bearing retaining plate so the V-shaped cutout is towards the right-hand side of the shaft. Replace the four countersunk screws and where utilised, the oil deflector plate. Tighten the screws fully.
A large thick walled tube is an ideal drift. When the seal is in place, stake the casing inwards against the seal body in two places, using a cold chisel. Fit the 'L' shaped key so that the longest portion locates in the sleeve pinion spline and the short portion locates with the recess in the oil seal collar.



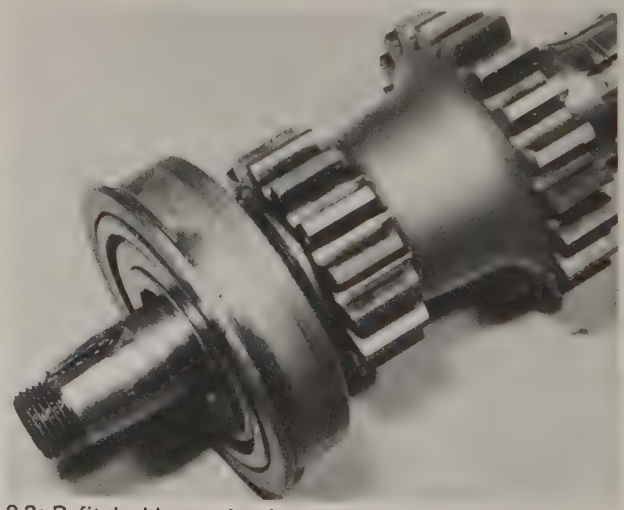
9.1a Ensure that sleeve pinion 'O' ring is in place



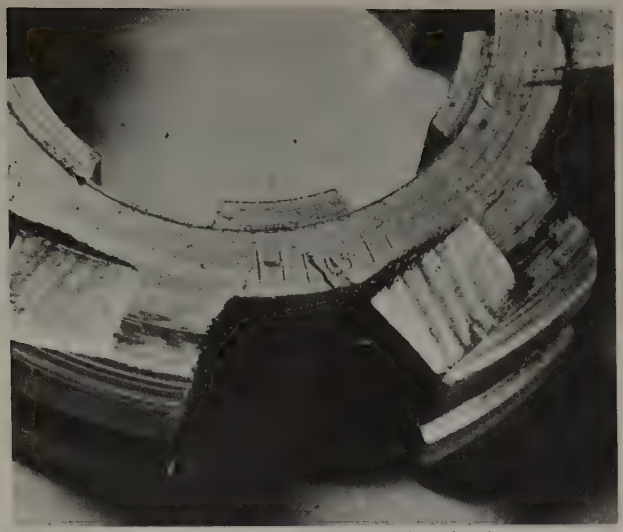
9.1b Insert 44 needle rollers, holding with heavy grease



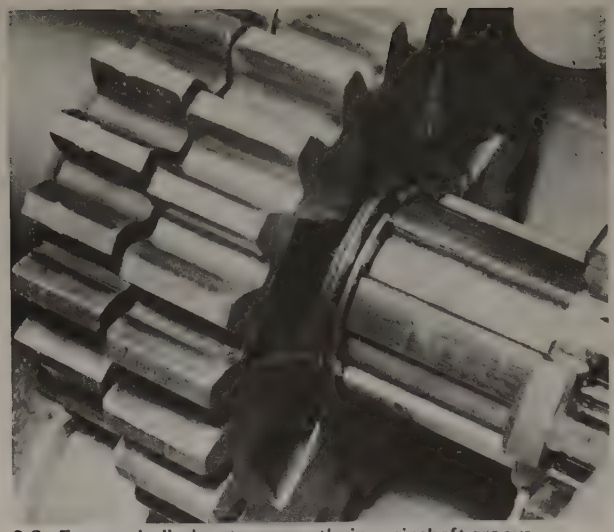
9.1c Carefully refit the sleeve pinion



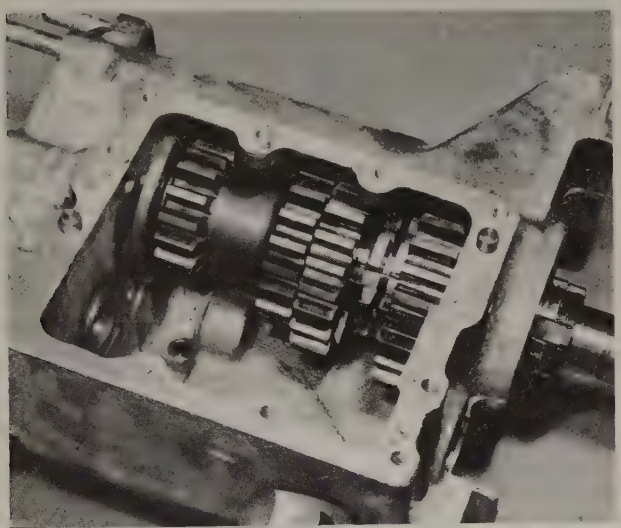
9.2a Refit double gear, bearing and sleeve to mainshaft



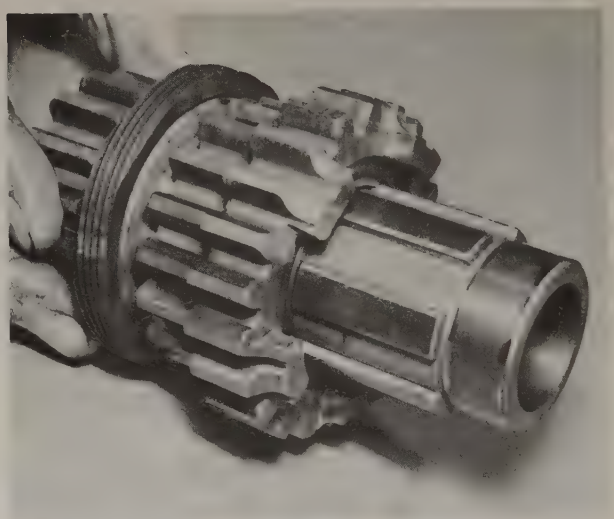
9.2b Note 'HIGH' mark on sleeve pinion dog clutch



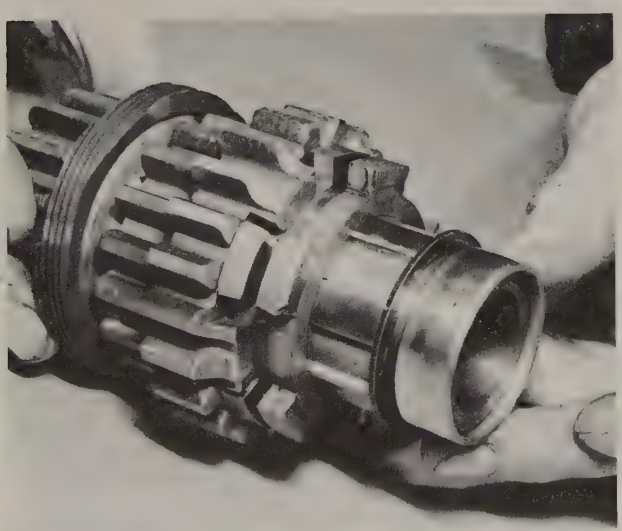
9.2c Ensure circlip locates correctly in mainshaft groove



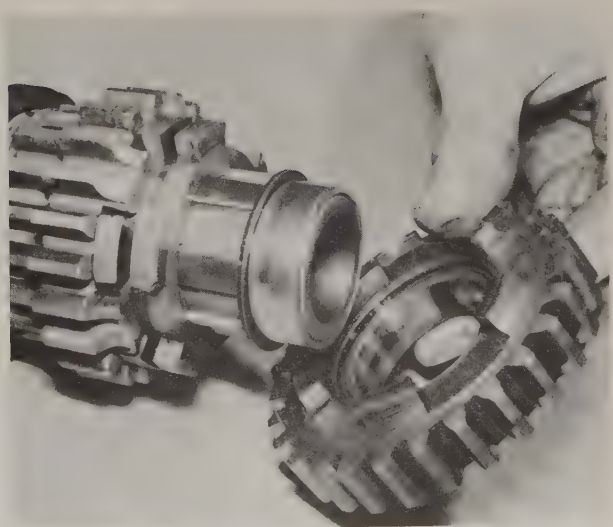
9.2d Mainshaft assembly - general view



9.4a Assemble 2nd gear pinion on layshatt double gear

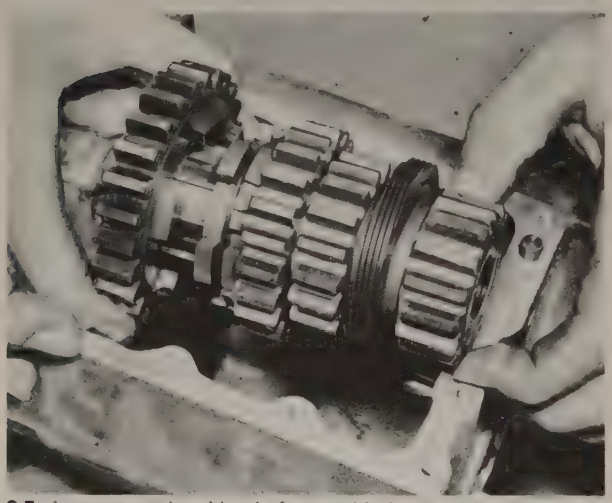


9.4b Fit sliding dog clutch and washer then ...



9.4c ... replace the final gear pinion

9.4d Assemble needle rollers in both ends of layshaft assembly



9.5a Lower completed layshaft assembly into casing and ...

9.5b ... slide right-hand end washer into place

**10 Gearbox reassembly: refitting the selector forks and selector mechanism**

1 If new selector forks have been fitted, or the selector fork assemblies have been dismantled, they must be refitted to the gearbox and adjusted by means of shims, so that they are in correct relationship to each other. This procedure requires the use of a selection of shims of 0.007 and 0.014 in (0.18 and 0.36 mm) thickness and a special gearbox setting tool. The adjustment cannot be carried out satisfactorily without the special tool, and therefore it is necessary to return the gearbox to a Harley-Davidson specialist for this simple yet vital operation.

2 Position the two fully assembled selector forks in the gearbox so each one engages with the channel on its respective sliding dog clutch. The forks are not interchangeable; the fork with the larger diameter must engage with the layshaft dog clutch. Check the condition of the 'O' ring fitted to the groove in the left-hand end of the shaft, renewing it if necessary. Slide the shaft into position, locating it with the selector forks, and then fit the retaining grub screw, Ensure that the narrowed end of the screw engages correctly with the shaft groove.

3 Continue reassembly by refitting the components supported by the gearbox cover. Oil the gearbox cover bronze bush and invert the cover so that the selector quadrant and backing spring can be replaced. Insert the selector shaft so that it engages the quadrant. The centre gap between the quadrant teeth is marked with a scribed line. To ensure that correct gear selection can be made, the selector shaft can be refitted in only one position. The scribed mark must align with the portion of the shaft boss adjacent to the extreme left-hand spline. See the accompanying diagram. Secure the selector quadrant with a new split pin through the radial hole in the shaft.

4 Correct gear selection demands also that the gear change drum is fitted in correct relationship with the selector quadrant. The change drum must be refitted so that the slightly relieved (ground back) tooth on the drum aligns with the scribed line on the quadrant. Insert the shaft through the gearbox cover and the change drum. Do not omit the 'O' ring which should be fitted to the widest of the two grooves in the right-hand end of the shaft. Check the timing of the quadrant and change drum before securing the shaft with the grub screw, locating in the left-hand groove.

5 Position the gear selector back plate, together with a new gasket over the outer end of the selector shaft. Fit the plate centre screw but do not tighten it at this juncture. Once again a procedure for timing the selection of gears must be made. Refit the change drum detent plunger together with the spring, tab washer and housing. Rotate the change drum so that the plunger engages any but the neutral notch in the change drum. The first gear position is with the change drum in the fully anti-clockwise direction, looking from the selector end. Rock the change drum slightly to ensure that the plunger is seating perfectly. Rotate the base plate so that the punched timing mark on the plate aligns EXACTLY with the selector shaft spline which is second from the left. Tighten the back plate centre screw and check carefully the alignment. Before continuing, check that all five positions of the change drum can be reached.

6 The pawl carrier is fitted against the pressure of the pawl springs, and this, together with the reluctance of the centraliser springs to stay in place in the guides, makes refitting a job requiring patience. The procedure is as follows: Fit the centraliser springs in their guide troughs and grease them thoroughly. Fit the two pairs of springs and plungers to the plunger block. Position the two plungers so the stepped portions face each other. Oil the plungers and the carrier bronze bush. Place the plunger carrier, slightly offset, over the selector shaft boss. Push the carrier towards the centre position so that the bronze bush fits over the boss simultaneously with the centraliser projection on the carrier entering the gap between the two centraliser springs. The centraliser springs will probably attempt to spring from position, and

the plungers will attempt to rotate in the plunger block. When this happens, take the plunger carrier off, reposition the plungers and centralisers, and attempt the procedure again.

7 Position the selector box body on the backing plate so that the recessed portion is adjacent to the similarly shaped cutout in the backplate. Insert the five countersunk screws and fit and tighten the securing nuts. Place the selector arm/plate unit in position and fit and tighten the three screws.

8 The gearbox cover is now ready to be refitted to the main gearbox casing. Rotate the change drum so that it is in the neutral position and move the selector forks independently until the gears are also in neutral. Lubricate the gears thoroughly with engine oil and apply a little lubricant to the channels in the change drum. Place a new cover gasket in position on the gearbox casing so that it locates with the two dowel pegs. Fit the selector fork roller to each fork pin. Lower the gearbox cover into place, checking at the same time that the selector fork rollers enter their respective channels in the change drum. Fit and tighten the twelve countersunk screws and the special drilled breather bolt, which fits in the right-hand side of the cover, in the centre right bolt hole.

9 Operate the gear selector arm, checking that each gear can be selected in turn. Lack of selection is usually caused by error in one of the three timing procedures.

10 Replace the kickstart pinion thrust backing spring and the pinion (where fitted). Insert the one or two Woodruff keys in the tapered end of the mainshaft and fit the kickstart ratchet. On electric start models, the plain boss is fitted in place of a ratchet. Replace the tab washer and mainshaft nut. Prevent the shaft from turning when tightening the nut in a manner similar to that used when dismantling.

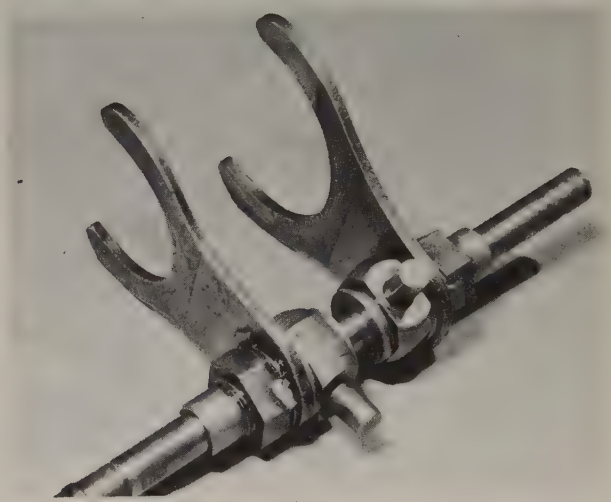
11 Place a new gasket over the end cover studs and replace the cover. On kickstart machines, the starter mechanism must be refitted first and on all machines the clutch thrust bearing must first be fitted.

12 Insert the speedometer drive gearbox into the side of the casing, using a new gasket between the flange and case. Fit and tighten the retaining screw. Replace the neutral indicator switch.

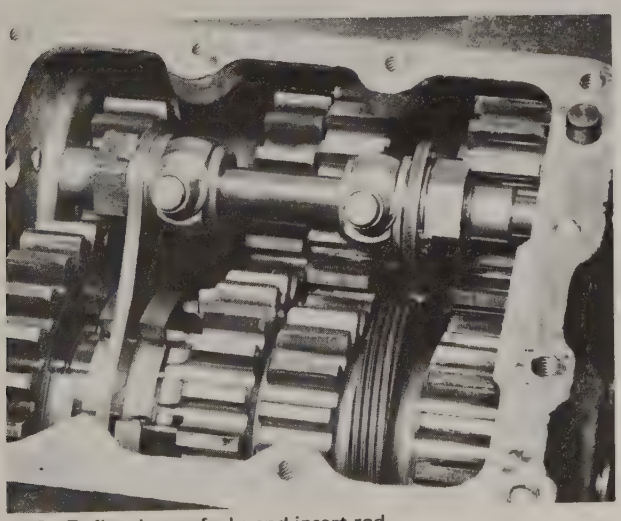
13 The gearbox is now ready for refitting into the frame. Reverse the removal sequence, referring also to Chapter 1, Section 35.

14 Replenish the gearbox with 1.5/1.2 US/Imp pints (0.7 litre) of the specified grade of oil.

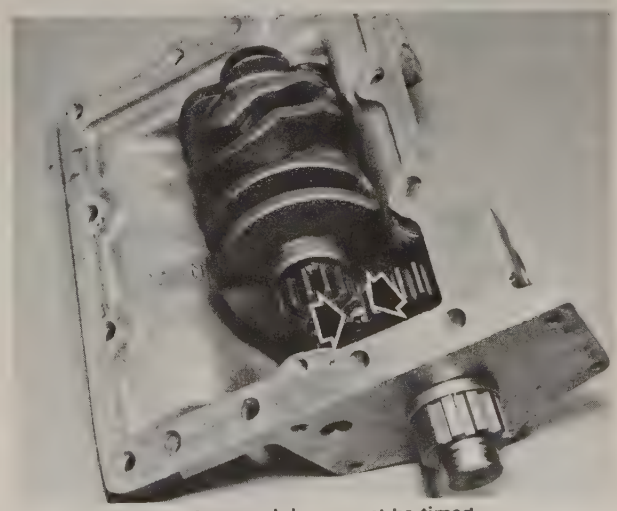
10.1 Selector fork assembly; note the two shims



10.2a Selector forks - general view



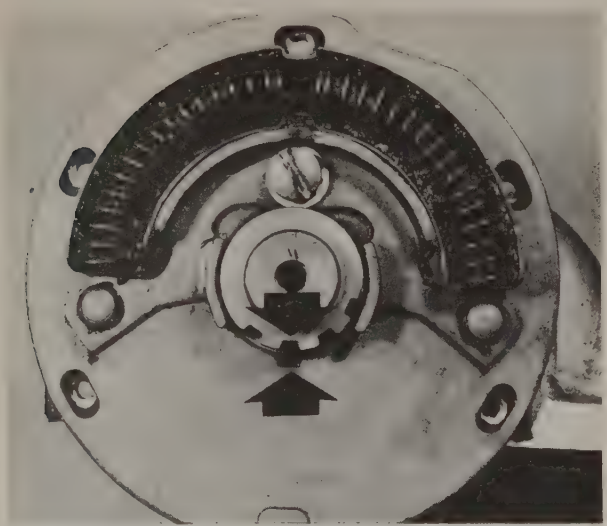
10.2b Refit selector forks and insert rod



10.4a Selector quadrant and drum must be timed

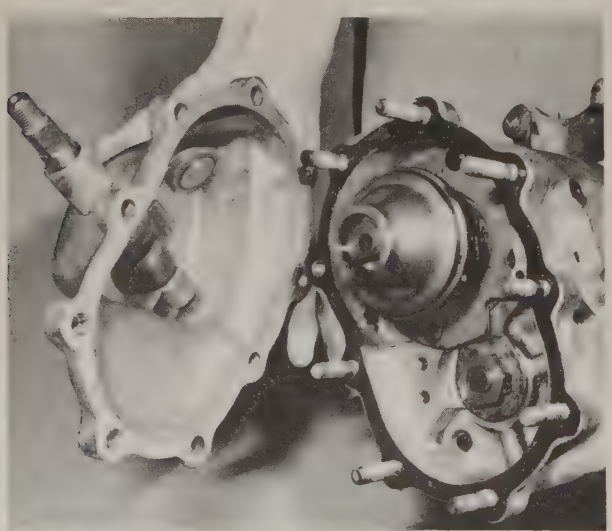
10.4b Note 'O' ring on change drum shaft

10.4c Relieved tooth on drum for timing

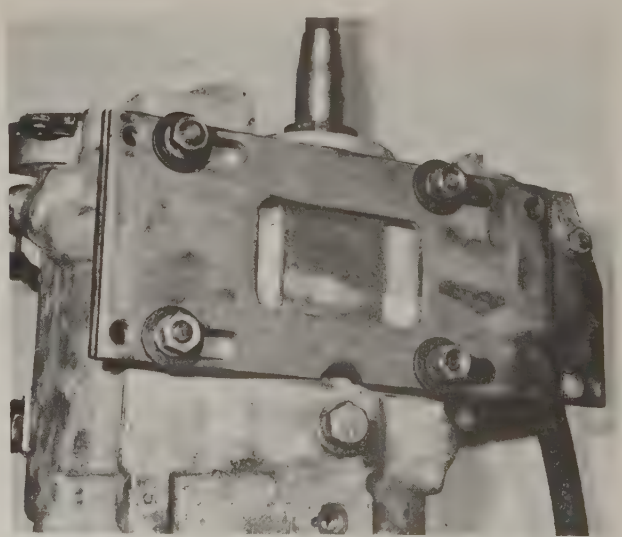


10.5 Backplate must be timed with selector shaft

10.8 Note special breather screw in top cover



10.11 Clutch release cam must locate with thrust bearing recess



10.13 Gearbox baseplate can be fitted only one way

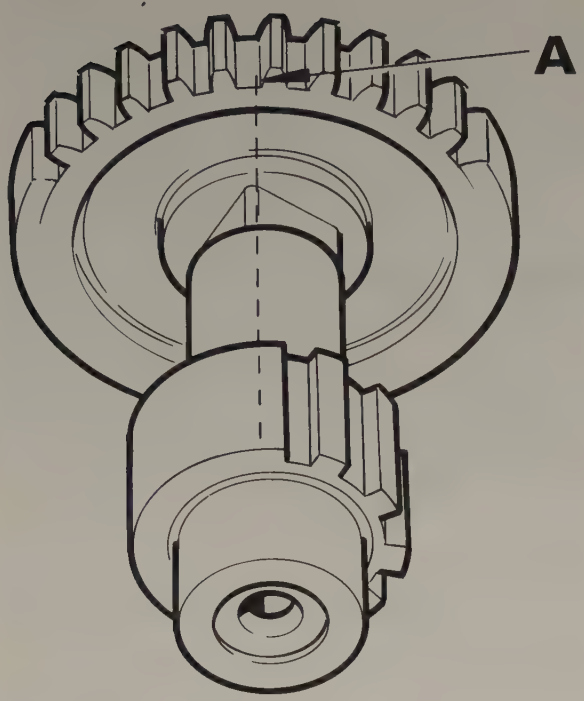



**Fig. 2.4. Refitting selector shaft to quadrant**

*A = Timing mark*
*Quadrant must be refitted so that marked tooth gap aligns as shown*

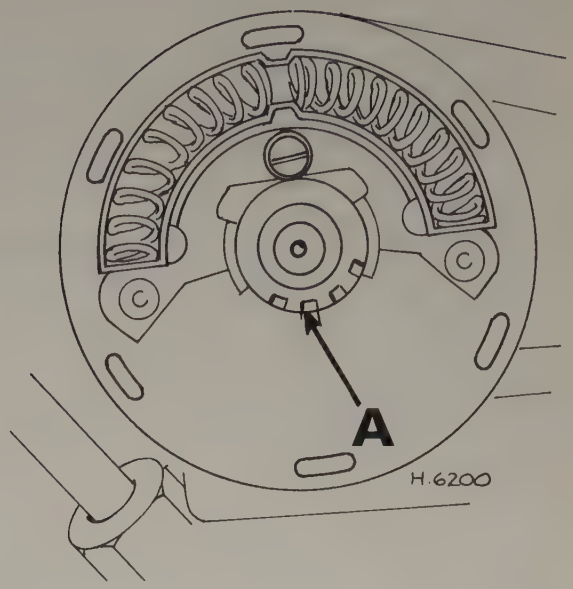



**Fig. 2.5. Timing selector backplate to selector shaft**

*A = Depression in backplate*
*'A' must align with splined channel*

**11 Fault diagnosis: gearbox**

| Symptom | Cause | Remedy |
|---|---|---|
| Kickstart does not return when engine is turned over or started | Broken kickstart return spring | Renew. |
| Kickstart slips and will not turn engine over | Worn ratchet assembly | Renew. |
| Kickstart jams | Worn ratchet assembly and/or kickstart quadrant | Renew. |
| Difficulty in engaging gears | Gear selectors not indexed correctly | Check alignment of 'timing' marks within selector box. |
| | Selector forks bent or badly worn | Renew. |
| Machine jumps out of gear | Camplate plunger spring lost tension | Renew spring. |
| | Worn dogs on gear pinions or dog clutches | Renew defective items. |
| Gear change lever does not return to original position | Broken centraliser spring(s) | Renew spring in selector box. |

# Chapter 3 Clutch and primary drive

**Contents**


General description ... 1
Dismantling the clutch and primary drive ... 2
Clutch assembly: examination and renovation ... 3
Reassembling the clutch and primary drive ... 4
Clutch adjustment ... 5
Primary chain and engine sprocket assembly: examination and renovation ... 6
Adjusting the primary chain tension ... 7
Fault diagnosis: clutch ... 8


**Specifications**

| | |
|---|---|
| **Clutch** | |
| Type | Dry, multi-plate |
| No. of plates:- | |
| Plain | 4 |
| Friction | 5 |
| No. of springs | 10 |
| Spring free length | 1 45/64 in (43.25 mm) |

## 1 General description

Transmission of the engine power to the gearbox mainshaft is by traditional primary chain and multi-plate clutch. The primary chain is of the duplex roller type running on a sprocket fixed to the left-hand flywheel mainshaft and one integral with the clutch outer drum.

The cam type crankshaft - mounted shock absorber utilised on earlier models is no longer fitted, although the cam components of this unit, locked together, are retained to provide a fixing method for the engine sprocket.

The clutch consists of a number of 'plain' drive plates sandwiched alternately with 'friction' driven plates, which are under pressure from ten coil springs. By means of a pushrod passing through the hollow mainshaft, and a camshaft in the gearbox end cover, the spring pressure may be counteracted to disengage the clutch.

On electric start models the starter driven gear is attached to clutch outer drum.

## 2 Dismantling the clutch and primary drive

1 The clutch may be dismantled after removal of the primary chaincase cover, without having to disturb the engine or gearbox assemblies. Because the primary chain is not fitted with a connecting link, removal of the clutch outer drum and the engine sprocket must be carried out simultaneously. Removal of the primary drive chain or engine sprocket requires that the clutch is partially dismantled to allow the outer drum to be removed.

2 On the Super Glide model, remove the gear change lever from the splined shaft. The lever is secured by a pinch bolt. Place a shallow drain pan below the chaincase to catch the small amount of lubricant within the casing. Loosen the eight primary chain case cover retaining screws evenly and then remove them. Pull the cover from position, after breaking the gasket seal with a rawhide mallet.

3 Commence primary drive removal by loosening the engine sprocket sleeve nut. The nut is usually very tight and will therefore require the use of a close fitting spanner with a suitable long handle with which to apply sufficient leverage. To prevent the nut from rotating, place the machine in top gear and using a length of string, tie the foot brake pedal in the fully on position. Some models are fitted with a sprocket nut that requires a special peg spanner for removal and assembly. The Harley-Davidson service tool No. 94557-55 is the recommended tool, but it is unlikely to be freely available. In this case a suitable spanner will have to be fabricated which incorporates four pegs which engage with the face of the nut. After loosening, remove the nut followed by the large cam boss.

4 Free the complete chain tensioner unit by removing the large bolt which passes through the central block and secures the assembly to the rear of the chaincase.

5 The clutch spring back plate, the springs and the clutch pressure plate are removed as a unit. Because the two plates are under considerable pressure from the springs, a special procedure must be adopted to ensure safe removal. Loosen and remove the clutch adjusting screw locknut. Place a large washer, with an outside diameter greater than the central hole in the spring plate, over the adjuster screw and refit the locknut. Tighten the locknut until the springs are compressed slightly. The three spring tensioning nuts can now be unscrewed and the plate/spring unit removed in safety. The unit need be separated only if one or more of the components require renewal. To separate the unit safely insert three bolts through the original fixing holes and fit a nut to each bolt. Tighten the nuts until the springs are compressed slightly and then remove the locknut and adjuster screw. Separate the unit by loosening the three nuts progressively and evenly. The bolts must have threads of a sufficient length to allow complete releasing of the spring pressure.

6 Withdraw the clutch operating pushrod from the hollow mainshaft. Remove the clutch plates, one at a time, noting their relative positions to aid reassembly. Grasp the clutch outer drum with one hand and the engine sprocket with the other, and lift the two components off simultaneously, complete with the primary chain and chain tensioner.

7 Loosen and remove the clutch centre nut after knocking down the ears of the tab washer. Note that this nut has a left-hand thread and must therefore be undone in a clockwise direction. The clutch centre boss is fitted on a tapered portion of the gearbox mainshaft and is located by a Woodruff key. Due to this the centre boss will be very tight and will require drawing from position. A suitable puller can be fabricated from a circular plate of 1/8 inch or 1/4 inch steel, a long bolt and a nut. The plate should be drilled to fit over the three longest studs projecting from the clutch boss, so that it can be retained by the three spring tension nuts. A central hole must also be drilled to take the long bolt, the nut of which should be fitted to the inside of the plate. Before fitting the puller, screw the centre nut onto the mainshaft approximately half a dozen turns to prevent the shaft threads from becoming damaged from the pressure of the bolt. The clutch pushrod oil seal, fitted into the end of the nut must also be protected from the end of the bolt, by using a washer. After removal of the clutch centre, prise the Woodruff key from the shaft using the blade of a screwdriver.

## 3 Clutch assembly: examination and renovation

1 Check the condition of the clutch sprocket, to ensure none of the teeth are chipped, broken or badly worn.

2 Give the plain and the inserted plates a wash with a petrol/paraffin mix and check that they are not buckled or distorted. Remove all traces of clutch insert debris, otherwise a gradual build-up will occur and affect clutch action.

3 Visual inspection will show whether the tongues of the clutch plates have become burred and whether corresponding indentations have formed in the slots with which they engage. Burrs should be removed with a file, which can also be used to dress the slots square once again, provided the depth of the indentations is not too great. The plain plates are fitted with a buffer clevice on the trailing edge of each slot. The buffer consists of a cage holding a spring loaded ball. If the cage is damaged or the ball no longer returns, the buffer unit must be renewed. The cage is held in position by two rivets, the heads of which may be ground off to allow removal with a punch.

4 Check the thickness of the friction plates. If the linings have worn near to the rivets, they must be renewed. Always renew them as a complete set, irrespective of whether some may not have reached the serviceable limit. Worn friction plates promote clutch slip. Each friction disc is assembled from a steel carrier plate sandwiched between two discs of lining material, which are riveted in position. The old rivets may be drilled out to release the linings and allow new linings to be fitted. It is imperative that the re-riveting of the linings is carried out with care, to ensure that the rivets are quite tight. Loose rivets will promote snatch loads and cause a break up of the plate in question.

5 Check the free length of the clutch springs against the Specifications section of this Chapter. Do not stretch the springs if they have compressed. They must be renewed when the serviceable limit has been reached.

6 The bearing upon which runs the clutch outer drum is of the single cage double row roller type and is mounted on the clutch

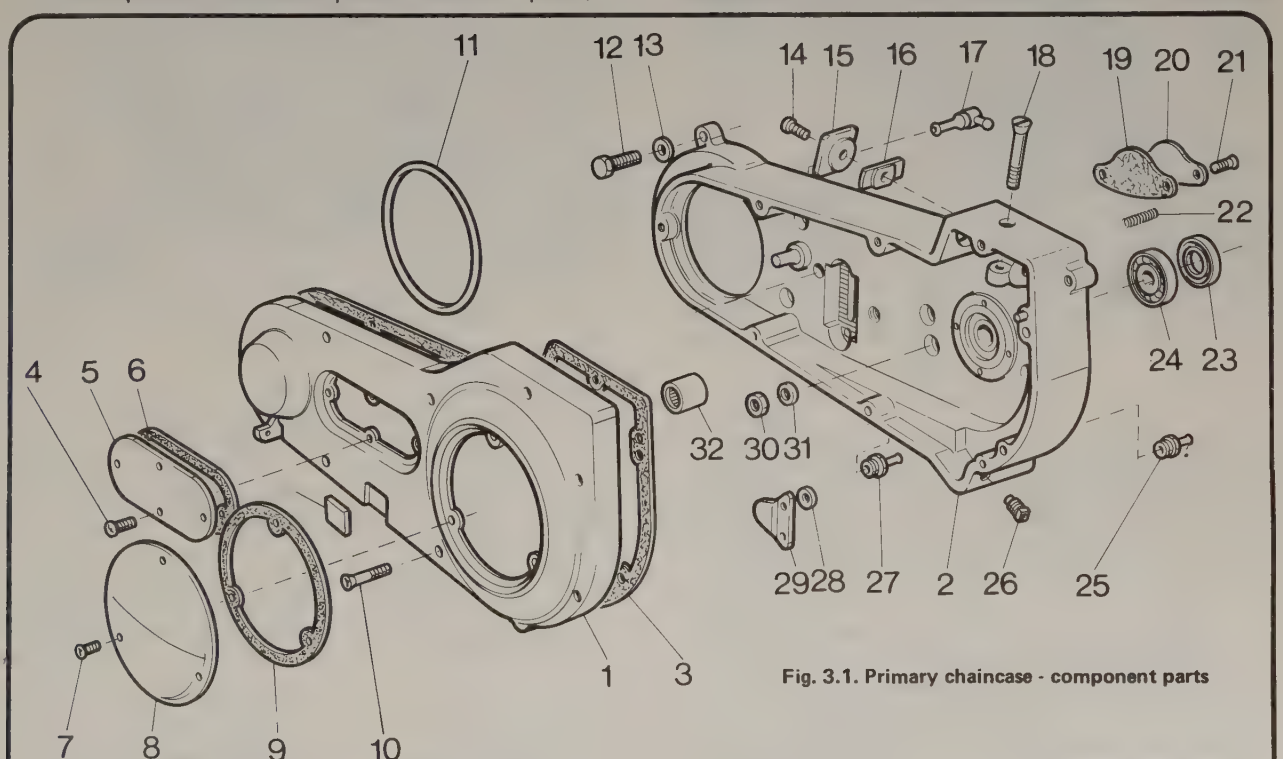



Fig. 3.1. Primary chaincase - component parts

1 Primary chaincase cover
2 Primary chaincase inner
3 Gasket
4 Screw - 4 off
5 Inspection cover
6 Gasket
7 Screw - 4 off
8 Clutch cover
9 Gasket
10 Screw - 8 off
11 'O' ring
12 Bolt - 4 off
13 Washer - 2 off
14 Screw
15 Solenoid hole blanking cover - non electric start
16 Cover securing bar - non electric start
17 Oil feed union
18 Pivot screw
19 Gasket - no electric start
20 Starter motor blanking plate - non electric start
21 Screw - 2 off
22 Stud - 2 off
23 Oil seal
24 Clutch shaft bearing
25 Breather hose union
26 Drain plug
27 Oil return union
28 Washer - 2 off
29 Feed orifice guard
30 Nut - 4 off
31 Washer - 4 off
32 Starter shaft outer bearing

centre boss. Check the fit of the clutch outer drum on the bearing. If radial play is evident attention to the bearing is required. Provided that the condition of the bearing inner and outer races is good, the bearing rollers alone may be renewed. If the bearing tracks are pitted or scored, the races must be renewed, together with the main component to which they are attached. To remove the bearing cage and rollers, prise off the three spirial springs from the long clutch studs. Lift the retainer plate from position. As the cage is removed, the rollers will fall free.

7 Check the clutch pushrod for straightness, if necessary, by rolling it on a sheet of glass. Heavy action is often caused by a bent rod, which may pick up in its housing. If oil has been finding its way along the mainshaft, check the condition of the clutch pushrod seal which is fitted to the centre of the clutch retaining nut. The seal can be prised from position and a new component drifted into position.

8 A journal ball bearing is fitted in a housing in the rear of the primary chaincase, to act as an outrigger bearing for the gearbox mainshaft. This bearing is prone to lack of lubrication and consequent failure. Check the bearing for up and down play and roughness, when rotated. If the bearing requires renewal, the chaincase must be removed by detaching it from the gearbox and engine crankcase, as described in Chapter 1 Section 6. 7-10. In addition, the battery and carrier must be removed if electric starting is utilised.

9 The outrigger bearing may be drifted from place, driving with it the oil seal. Heat the case to approximately 150°F before attempting removal. It is recommended that a special ball bearing, prepacked with grease and incorporating an oil seal, is used as a replacement. This will prevent further failure due to lack of lubrication.

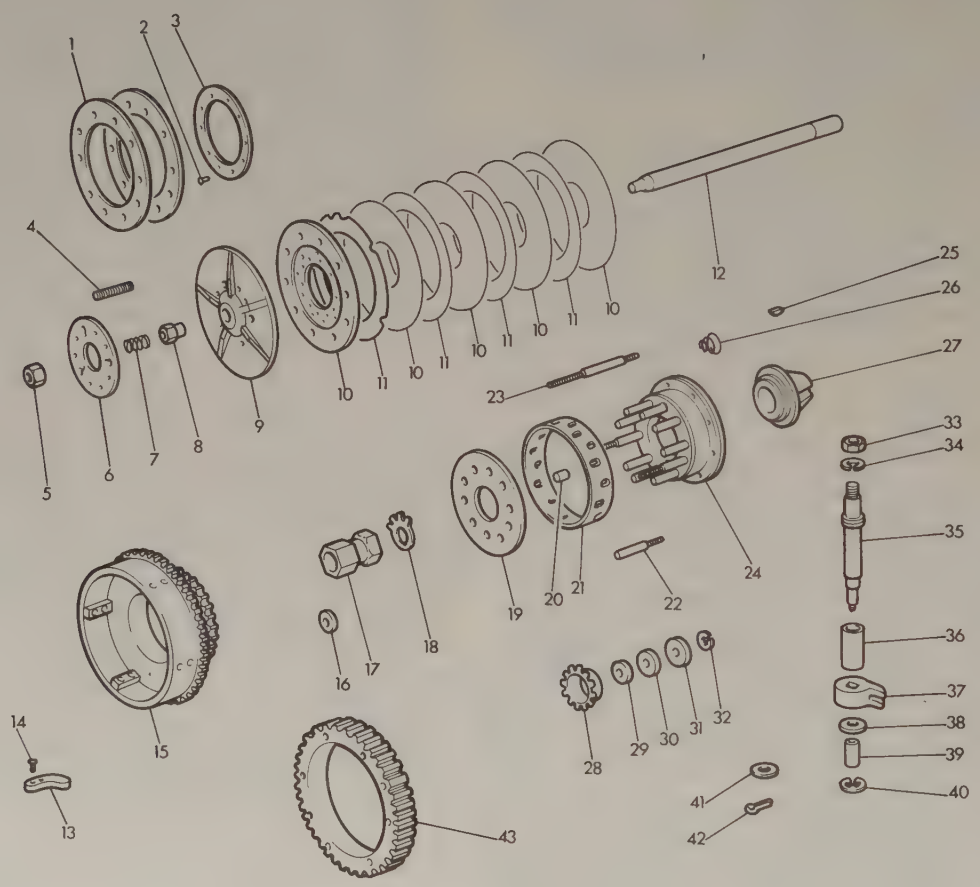
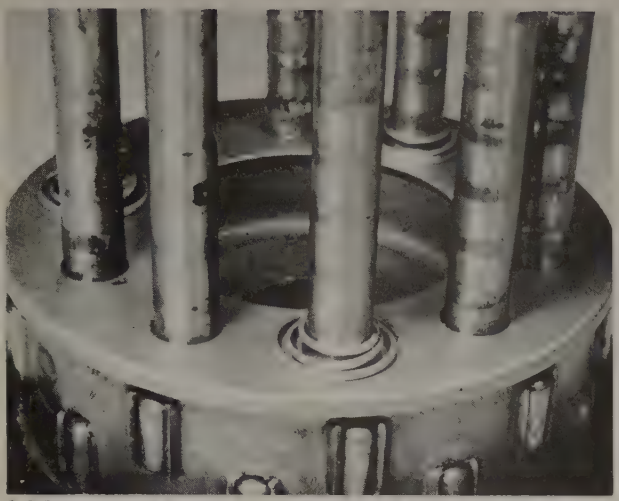
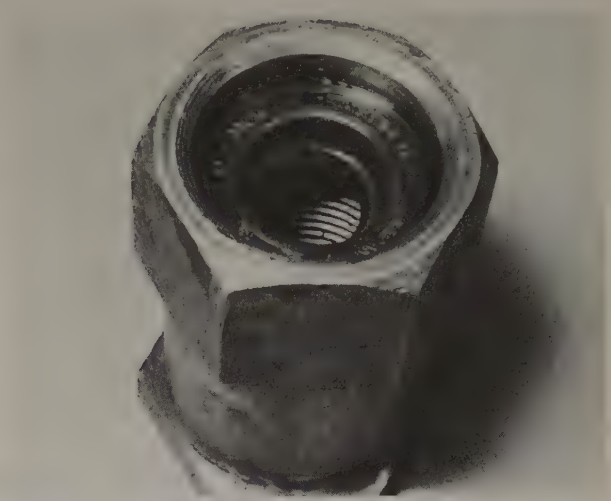



**Fig. 3.2. Clutch assembly - component parts**

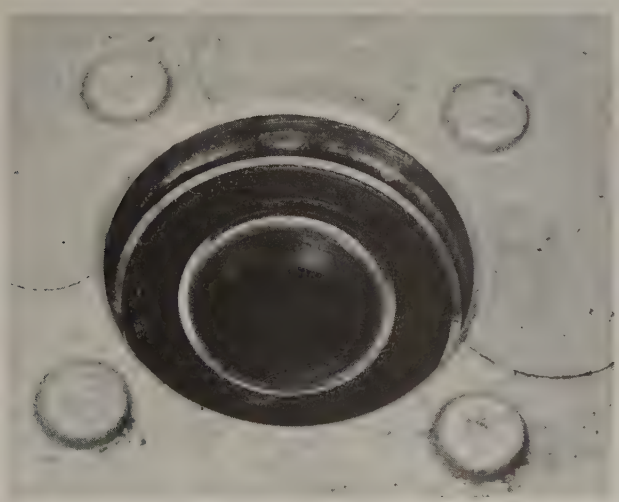
1 *Friction plate lining set - 10 off*
2 *Rivet - 38 off*
3 *Clutch centre friction disc*
4 *Adjuster screw*
5 *Spring pressure adjuster nut - 3 off*
6 *Spring backplate*
7 *Clutch spring - 10 off*
8 *Locknut*
9 *Pressure plate*
10 *Friction plate - 5 off*
11 *Plain plate - 4 off*
12 *Clutch operating pushrod*
13 *Plain plate buffer - 10 off*
14 *Rivet - 20 off*
15 *Clutch outer drum/primary sprocket*
16 *Pushrod oil seal*
17 *Clutch nut/seal housing - LH thread*
18 *Tab washer*
19 *Bearing backing plate*
20 *Bearing roller - 20 off*
21 *Bearing cage*
22 *Plate stud - 7 off*
23 *Stud - 3 off*
24 *Clutch centre*
25 *Woodruff key*
26 *Retaining spiral spring - 3 off*
27 *Clutch release bearing - 1973 - 1975*
28 *Clutch release bearing cap - 1975 on*
29 *Thrust washer - 1975 on*
30 *Thrust bearing - 1975 on*
31 *Thrust washer - 1975 on*
32 *Circlip - 1975 on*
33 *Nut*
34 *Spring washer*
35 *Shaft*
36 *Upper bush*
37 *Release fork*
38 *Washer*
39 *Lower bush*
40 *Circlip*
41 *Washer*
42 *Split pin*
43 *Starter ring*



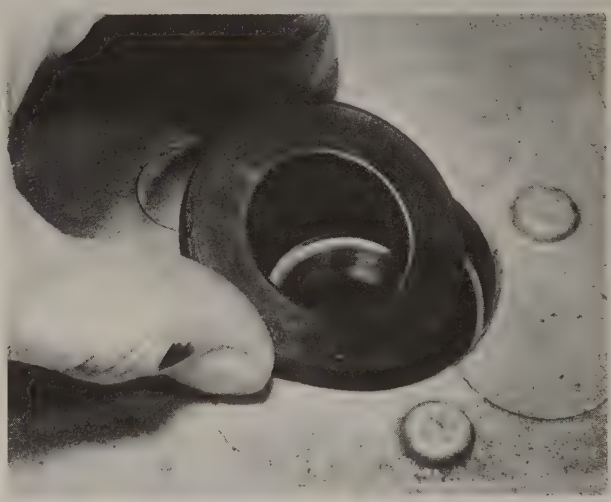
3.6 Bearing cage is retained by three spiral springs



3.7 Pushrod oil seal can be prised out of nut



3.8a Modified outrigger bearing is sealed



3.8b Also refit original seal

## 4 Reassembling the clutch and primary drive

1 Refit the clutch unit and primary drive components by following the procedure laid down in Chapter 1, Section 35. As noted in paragraph 15 of that Section, it is important that the chaincase is airtight after complete reassembly. In addition to the renewal of suspect seals, and care exercised in assembly, the clutch outrigger bearing outer race should be treated with Locktite 'A' before being replaced in the casing. The inner race should be treated likewise, when refitting the case over the gearbox mainshaft.

## 5 Clutch adjustment

1 Apart from the clutch spring tensioner nuts, there are two other means of adjusting the clutch action, mainly with regard to the operation of the clutch disengagement control. A cable adjuster is mounted on a bracket bolted to the frame rear downtube so that slack can be taken out of the clutch cable, as the clutch beds down or the cable stretches. An adjuster screw is fitted to the clutch pressure plate which controls the operation of the clutch operating pushrod and hence the operating arm on the gearbox.

2 Adjustment of the clutch should be made in two stages. Move the clutch operating arm on the gearbox forward until all play has been taken up. In this position measure the distance between the starter motor casing and the clutch arm. The distance should be 3/8 - 5/8 in (9.5 - 16.0 mm). If the distance is incorrect, adjustment should be made at the adjuster screw in the clutch pressure plate. To gain access to the screw, remove the clutch inspection cover, which is retained by three screws. Slacken the sleeve locknut which secures the screw and turn the screw inwards or outwards until the gap at the arm is ½ in (12.5 mm). When the adjustment is correct, tighten the locknut and replace the clutch inspection cover. Adjustment of the free play at the handlebar lever can now be made. Adjustment is correct if the handlebar lever can move approximately ¼ in (6 mm) before clutch disengagement commences.

3 When refitting the clutch plates and springs, the spring tensioner nuts should be tightened down evenly until the distance between the clutch pressure plate and the back of the spring plate is 1 1/32 in (25.5 mm). If clutch slippage has occurred, the spring tension may be increased temporarily until the cause of slip has been rectified. Do not tighten the nuts down so that the pressure plate/spring plate gap is less than 7/8 in (0.875 mm) or full disengagement of the clutch will be impossible.

### 6 Primary chain and engine sprocket assembly: examination and renovation

1 The primary chain and the sprockets upon which it runs work in almost ideal conditions, being totally enclosed and supplied with a constantly filtered lubricant from the engine. Because the primary drive train transmits the total engine power, progressive wear is inevitable.
2 Examine the teeth of the engine sprocket and if any are chipped,broken or hooked, the sprocket must be renewed, preferably in conjunction with the clutch sprocket and the primary chain. A badly worn sprocket will promote rapid chain wear and will absorb a surprising amount of power.
3 Some indication as to the condition of the primary chain may be seen in the amount of chain tensioner movement still available. If the chain is so stretched that the amount of slack is outside the maximum permissible, the chain must be renewed. Check each link plate and roller for fatigue or fracture. If damage of this kind is evident, the chain must be renewed. The consequence of a primary chain breaking is usually disastrous, at least damaging the clutch or flywheel mainshaft, at worst smashing the left-hand crankcase. In addition, a broken chain may lock the clutch and hence the rearwheel, unseating the rider dramatically. If there is any doubt as to the condition of the chain it should be renewed as a precaution.

### 7 Adjusting the primary chain tension

1 Place a shallow drain pan below the primary chain case and remove the eight casing screws. The rear pivot bolt on the footboard must be removed to allow the footboard to be swung down and allow removal of the casing. On some FX and FXE models, the gearchange pedal must be detached from the splines of the pivot shaft. The gearchange pedal is secured by a pinch bolt and nut. The primary chain tension should be measured at the centre of the upper run and is correct when total up and down movement is 5/8 - 7/8 in (0.625 - 0.875 mm) engine cold or 3/8 - 5/8 in (0.375 -0.625 mm) engine hot. Adjustment is controlled by a tensioning shoe which is retained on a serrated back plate by a single large centre bolt
2 To adjust the chain, loosen the centre bolt and move the tensioner carrier unit upwards or downwards until the play is as specified. Chain adjustment should always take place with the chain at the tightest point in its rotation. The wear on a set of chain and sprockets is rarely even and as such one or more tight spots may be found. After placing the shoe in the correct position, tighten the centre bolt and recheck the tension. Refit the chaincase, using a new gasket, if necessary, and then refit any ancillary components which were removed.

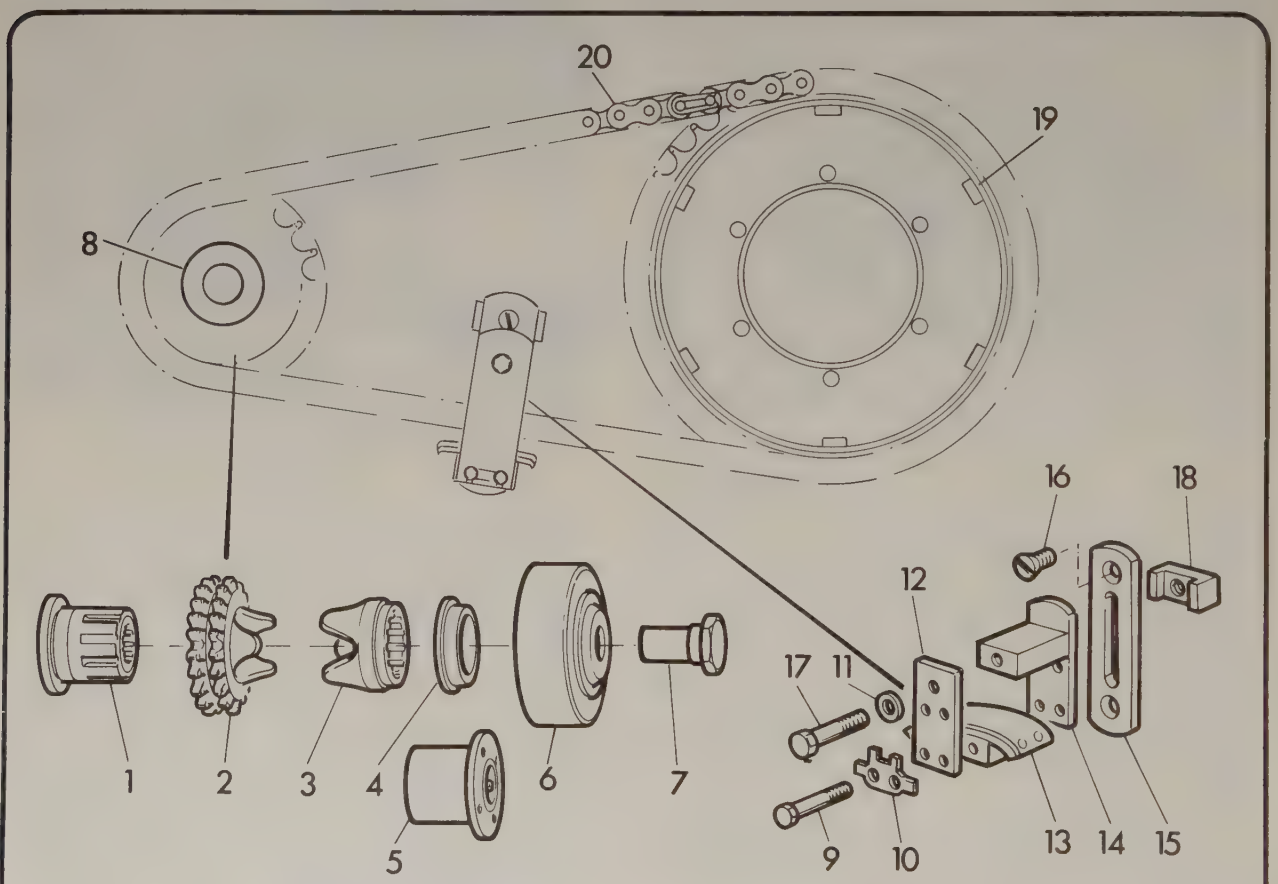



**Fig. 3.3. Primary drive sprocket and chain adjuster**

1 *Sprocket sleeve*
2 *Engine sprocket*
3 *Drive piece*
4 *Collar*
5 *Peg nut*
6 *Cover*
7 *Sleeve nut*
8 *Engine sprocket - complete*
9 *Bolt - 2 off*
10 *Lockplate*
11 *Washer*
12 *Outer shoe plate*
13 *Tensioner shoe*
14 *Inner shoe carrier*
15 *Serrated adjuster plate*
16 *Screw - 2 off*
17 *Bolt*
18 *Screw block*
19 *Clutch outer drum/driven sprocket*
20 *Primary drive chain*

**8 Fault diagnosis: Clutch**

| Symptom | Cause | Remedy |
|---|---|---|
| Engine speed increases but not road speed | Clutch slip; incorrect adjustment or worn linings | Adjust, or renew clutch plates. |
| Machine creeps forward when in gear; difficulty in finding neutral | Clutch drag; incorrect adjustment or damaged clutch plates | Readjust, or fit new clutch plates. |
| Machine jerks on take-off or when changing gear | Clutch centre loose on gearbox mainshaft | Check for wear and retighten retaining nut. |
| Clutch noisy when withdrawn | Badly worn clutch centre bearing | Renew bearing. |
| Clutch neither frees or engages smoothly | Burrs on edges of clutch plates and slots in clutch drums | Dress damaged parts with file if damage not too great. |
| Clutch action heavy | Over-tight tension springs or wrong angle of operating arm<br>Dry operating cable, or bends too tight | Slacken tension nuts or readjust operating arm.<br>Lubricate cable and reroute as necessary. |
| Clutch action harsh | Over-tight primary chain | Readjust primary chain. |
| Clutch 'bites' at extreme end of lever movement | Worn linings | Renew clutch plates. |

# Chapter 4 Fuel system and lubrication

**Contents**


| | | | |
|---|---|---|---|
| General description | 1 | Air cleaner: removing and replacing the element | 11 |
| Petrol tank: removal | 2 | Exhaust system | 12 |
| Petrol tap: removal and replacement | 3 | Engine lubrication | 13 |
| Cleaning the fuel filter | 4 | Removing the oil pump | 14 |
| Carburettor: removal | 5 | Oil pump: examination and renovation | 15 |
| Carburettor: dismantling and reassembly | 6 | Refitting the oil pump | 16 |
| Carburettor: cleaning | 7 | Oil filters: location and cleaning | 17 |
| Carburettor: adjustments | 8 | Oil pressure switch | 18 |
| Carburettor: settings | 9 | Checking the oil pressure | 19 |
| Carburettor: faults | 10 | Fault diagnosis: fuel system and lubrication | 20 |


**Specifications**

| | | |
|---|---|---|
| **Petrol tank** | | |
| **Capacity** | **total** | **reserve** |
| FL and FLH | 5/4.1 US/Imp galls (18 litres) or 3.5/2.9 US/Imp galls (13.5 litres) | 1.2/1 US/Imp galls (4.55 litres) or 1/0.83 US/Imp galls (4 litres) |
| FX and FXE (1973 - 74) | 3.6/3 US/Imp galls (13.6 litres) | 0.7/0.58 US/Imp galls (2.30 litres) |
| FX and FXE (1975 on) | 3.6/3 US Imp galls (13.6 litres) | 0.6/0.50 US/Imp galls (2.25 litres) |
| **Oil tank** | | |
| **Capacity** | 4/3.33 US/Imp qts (1.90 litres) | |
| **Gearbox** | | |
| **Capacity** | 1.5/1.2 US/Imp pints (0.7 litres) | |
| **Carburettor** | **1973 - 75 models** | **1976 models on** |
| **Make** | Bendix | Keihin |
| **Type** | 16P12 | — |
| **Bore** | 1 5/8 in | 38 mm |

## 1 General description

The fuel system is comprised of a petrol tank mounted above the engine from which petrol is fed by gravity to the float chamber of a fixed jet carburettor which feeds the two cylinders via a bifurcated manifold.

The Electra Glide is fitted with two separate fuel containers, interconnected by a balance tube and breather hose and arranged on the machine to give the impression of a single unit, similar to the monocoque item fitted to the Super Glide models. A fuel tap fitted to the underside of the petrol tank, and containing a mesh filter, is provided to enable the fuel flow to be controlled. The tap is provided with a 'reserve' position which gives a short duration of running after the main supply is exhausted.

Two different carburettors, of similar type, have been fitted to the range of models. 1976 and later models utilise a Keihin instrument whilst those of an earlier date are fitted with a carburettor of Bendix manufacture.

All models are equipped with a plastic foam air cleaner element enclosed in a box attached directly to the carburettor.

Engine lubrication is provided by a double gear-type oil pump mounted on the rear of the timing chest and driven by a shaft from a scroll gear fitted on the right-hand flywheel mainshaft, inboard of the timing pinion. The lubricant is fed under pressure to the working components of the engine via internal oilways and external rubber hoses. A supply of lubricant is contained within a reservoir mounted above the gearbox, which feeds the oil pump by gravity. The return flow of oil passes under pressure, through a mesh type oil filter housed in the oil tank.

## 2 Petrol tank: removal

Disconnect the petrol feed pipe, either at the tap union or at the carburettor after ensuring that the tap is in the 'off' position. Using the existing feed pipe or a suitable length of tube, drain the petrol into a clean container. Disconnect the rubber balance pipe which runs from one tank half to the other. The pipe is retained at each union by a heavy spring clip. To release the pressure on the hose, squeeze the ears of the clip together with a large pair of pliers or a self-grip wrench. Removal of the one-

piece Super Glide petrol tank is more straightforward. The front of the tank is secured by a single bolt running horizontally through the head stock and passing through the lugs welded to the tank. The rear of the tank is retained by a coil spring which hooks onto tabs attached to the tank. After removal of the bolt and spring, the tank can be lifted from position.

The petrol tank fitted to the Electra Glide consists of two separate containers retained independently at the top rear by two bolts, and by two long bolts passing through lugs in the frame and lugs on the tank. Commence tank removal by detaching the instrument panel cover. The cover is retained by a single central screw. Remove the pin upon which the Buddy seat is supported at the seat post. The pin is retained by a heavy wire clip, which locates with the seat frame. Hinge the seat upwards to its full extent and support it in this position. using a suitable length of rod or dowel placed between the seat pan and the workshop floor. Remove the two forward most bolts first then remove the final setscrew (bolt) holding each tank half.

## 3 Petrol tap: removal and replacement

1 If the petrol tap requires attention or the gauze filter needs cleaning, the complete unit will have to be unscrewed from the underside of the petrol tank. This will necessitate emptying the tank of its contents.
2 The filter gauze is a push fit on to the tap and will be exposed after the tap is withdrawn from the tank. If damaged, it can be renewed by pushing a replacement into position.
3 Double lever taps are sealed units. Should the tap itself leak badly or otherwise malfunction, it is not practicable to effect a satisfactory repair. The tap should be renewed as a complete unit. Later taps may be dismantled by removing the two crosshead screws from either side of the lever. The lever, spring and nylon valve may then be removed.
4 When refitting the tap, coat the threads with a sealant to prevent petrol from seeping along them.
5 It should be noted that the gland nut on post 1974 taps has a left-hand thread engaging with the petrol tap and a normal right-hand thread engaging with the boss on the underside of the petrol tank. As the gland nut is tightened the tap and the petrol tank are drawn together.

## 4 Cleaning the fuel filter

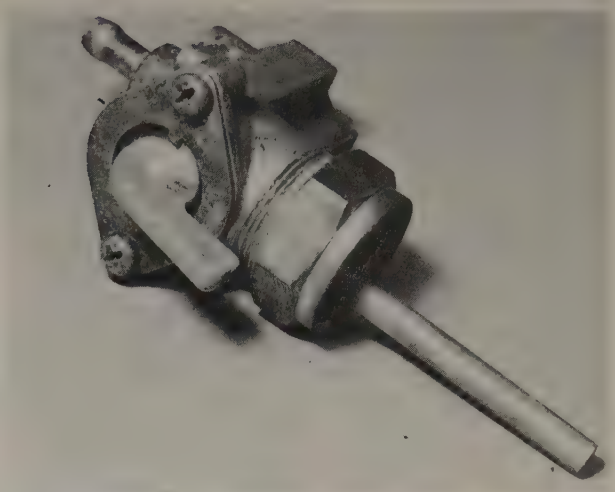
A fuel filter is fitted as an integral part of the petrol tap, which consists of a plastic and nylon cylindrical screen that projects into the petrol tank. To gain access to the filter, the petrol tap must be removed after draining the petrol tank of fuel. This operation may be facilitated if carried out when the supply of fuel is low.

Drainage of fuel in the right-hand petrol tank will occur automatically through the feed pipe which passes from the underside of one tank half to the other. To prevent this and so accelerate the draining operation, the pipe can be closed by means of any suitable clamps. Detach the petrol to carburettor feed pipe, either at the tap union or at the carburettor. To remove the tap, unscrew the large hexagonal gland nut above the tap body. Remove any deposits from the filter screen by washing in clean petrol and, if necessary, agitating with a soft brush.

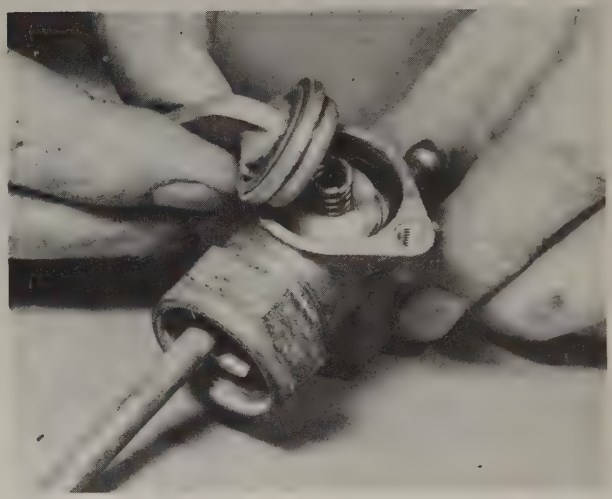
When refitting the petrol tap apply a petrol resistant sealing compound to the threads, to prevent leakage.

## 5 Carburettor: removal

1 Remove the air filter cover, which is retained by two countersunk screws. Lift out the air filter element and unscrew the four large screws which hold the air filter back plate in place. Disconnect the choke cable at the carburettor lever by unscrewing the anchor screw. On Bendix carburettors the throttle cable is



3.3a Unscrew the two screws to allow ...



3.3b ... removal of the lever and ...

3.3c ... the valve assembly

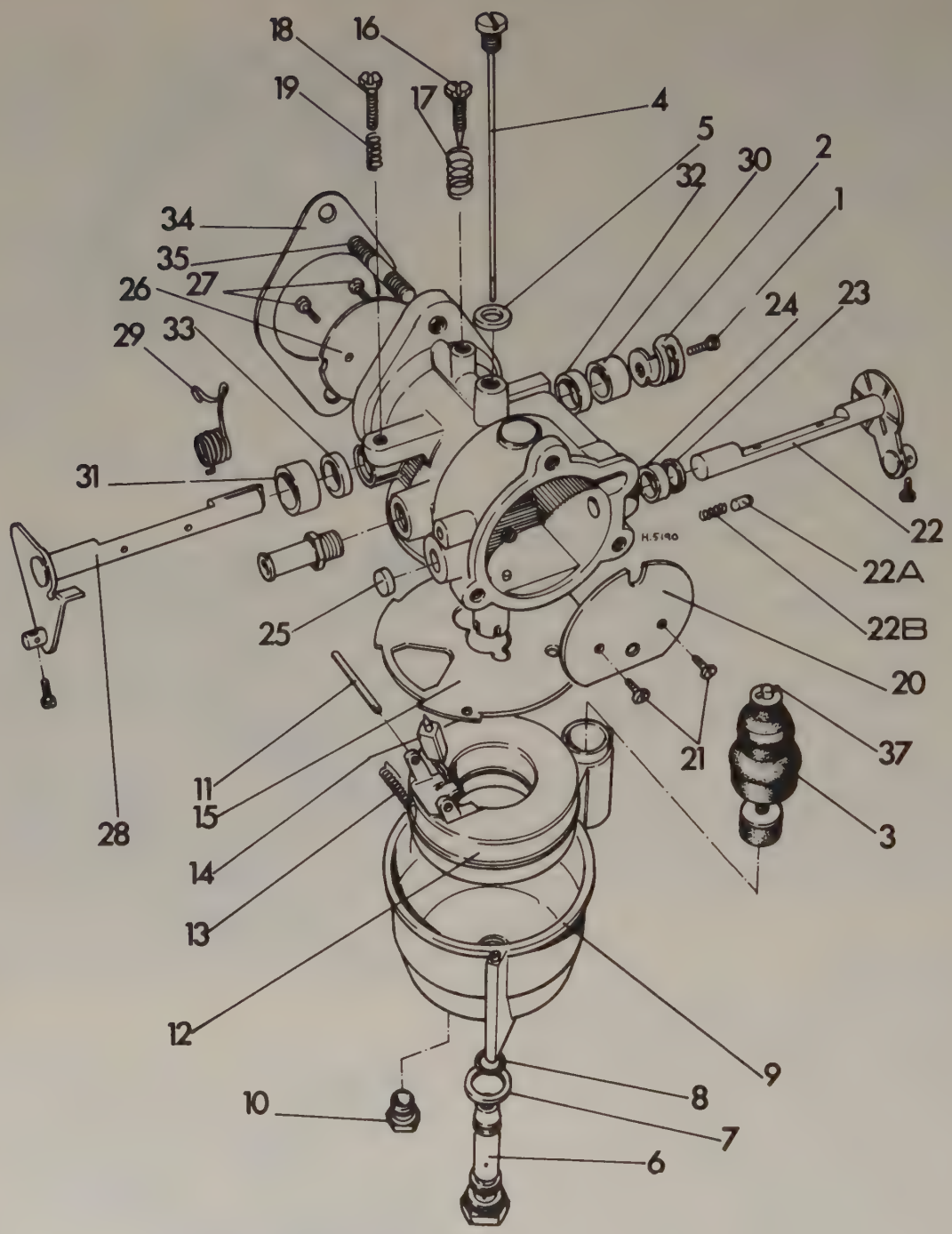



**Fig. 4.1. Bendix type 16P12 carburettor**

1 *Accelerator pump lever screw*
2 *Accelerator pump lever*
3 *Accelerator pump*
4 *Idle tube*
5 *Idle tube gasket*
6 *Main jet and tube assembly*
7 *Fibre washer*
8 *'O' ring*
9 *Float bowl*
10 *Float bowl drain plug*
11 *Float pivot pin*
12 *Float assembly*
13 *Float spring*
14 *Float valve needle*
15 *Gasket*
16 *Idle mixture needle*
17 *Idle mixture needle spring*
18 *Throttle stop screw*
19 *Throttle stop screw spring*
20 *Choke disc*
21 *Choke disc screw - 2 off*
22 *Choke shaft and lever*
22a *Plunger*
22b *Spring*
23 *Choke shaft seal retainer*
24 *Choke shaft seal*
25 *Choke shaft cup plug*
26 *Throttle disc*
27 *Throttle disc screw - 2 off*
28 *Throttle shaft and lever*
29 *Throttle shaft spring*
30 *Throttle shaft seal retainer*
31 *Throttle shaft seal retainer*
32 *Throttle shaft seal*
33 *Throttle shaft seal*
34 *Manifold gasket*
35 *Manifold stud - 2 off*
37 *Accelerator pump shaft pin*

secured in a similar manner. The throttle cable on Keihin instruments passes around a small pulley wheel. To disconnect the cable, rotate the pulley until the inner cable nipple can be freed.

2 Loosen and remove the two nuts which hold the carburettor in place on the induction manifold flange. Disconnect the fuel line either at the tap union or at the carburettor. Pull the carburettor from position. Note the fuel pipe guide clip is retained on the lower mounting stud, and on Bendix carburettors, the choke cable abutment bracket. The Bendix carburettor is fitted with a gasket between the flange and manifold, whereas the Keihin instrument has an 'O' ring seated in a groove, to ensure gas-tight seal.

## 6 Carburettor: dismantling and reassembly

### *Bendix type 16P12 carburettor only (Pre 1976 models only)*

1 Remove the accelerator pump lever screw and detach the accelerator pump as a complete unit. Unscrew the long idler tube and withdraw it, together with its gasket.

2 Remove the main jet from the centre of the float bowl, on the underside of the carburettor. It is a tight fit and may require a firm pull, when unscrewed. Remove its fibre washer and 'O' ring. Care must be shown when removing the main jet as the 'O' ring can be easily damaged. Use oil when reassembling with the 'O' ring.

3 Twist and remove the float bowl. Take out the pivot pin that retains the float assembly and remove the float, float needle, float needle clip and float spring as a complete assembly. Don't forget to remove the float bowl gasket.

4 Note the setting of the idle mixture screw and unscrew it. Repeat for the idle speed screw. The accelerator pump jet and needle need not be removed unless necessary. The jet is a push fit in the edge of the float bowl. Note that the jet orifice must align with an imaginary line drawn across the float bowl, passing through its centre.

5 Reassemble in the reverse order of dismantling, using new gaskets throughout. Take care not to overtighten any of the small components, otherwise they may shear off and present problems with their extraction. Make sure the float spring is installed correctly, so that the end of the spring rests against the inside of the float bowl. It is advisable to check the float level prior to reassembly. See Section 7.

### *Keihin carburettor (models 1976 on)*

6 Commence dismantling by removing the accelerator pump components from the base of the float chamber. Remove the three screws holding the pump cover in place. Note that one screw is considerably longer than the other two. A spring is hidden below the plate which may jump out if care is not exercised. Lift out the spring and the pump diaphragm and the two tiny 'O' rings which sit in recesses in the float chamber base and cover.

7 Unscrew the four screws which retain the float chamber to the mainbody. Lift the float chamber away vertically so that the accelerator pump operating rod leaves the tunnel without binding. Slacken the grub screw which secures the float chamber pivot pin. Push out the pin and lift the float from place. The float needle will come away simultaneously, being connected to the float tongue by a small spring clip. The needle and clip can be detached.

8 Unscrew the main jet from the raised boss in the centre of the mixing chamber base. Invert the carburettor body to allow the main nozzle to fall from position. Pull out the plug which is to the side of the main jet orifice and unscrew the slow speed jet.

9 Unscrew the pilot air screw and remove it, together with the spring.

10 Reassemble as outlined in paragraph 5. Ensure that the main float chamber/body 'O' ring and the three throttle pump 'O' rings are in good condition.

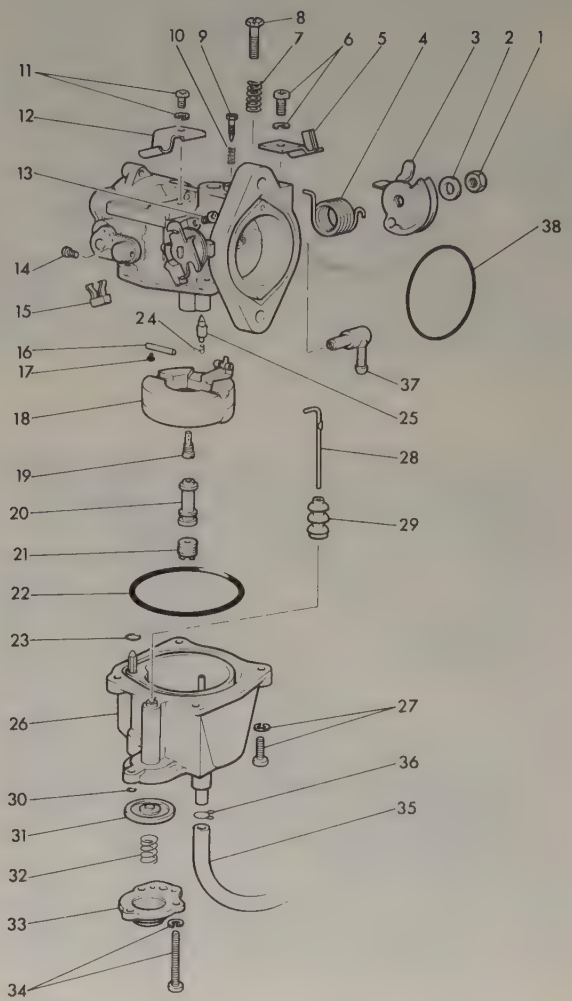
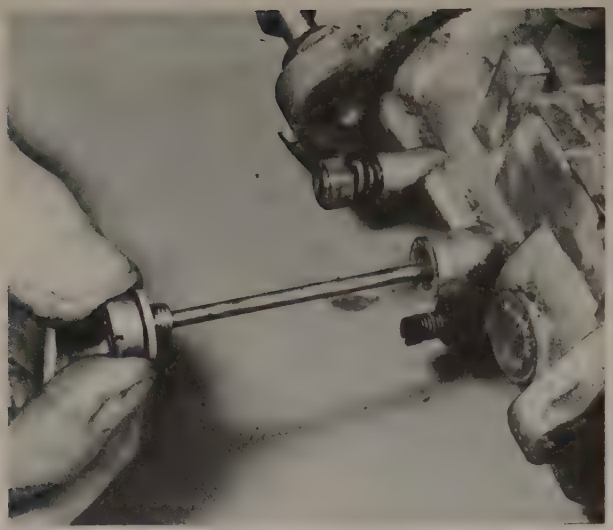
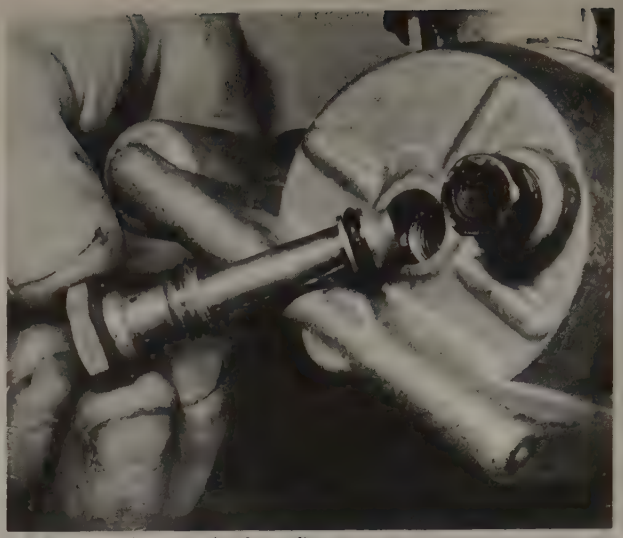



**Fig. 4.2. Keihin carburettor - 1976 models on**

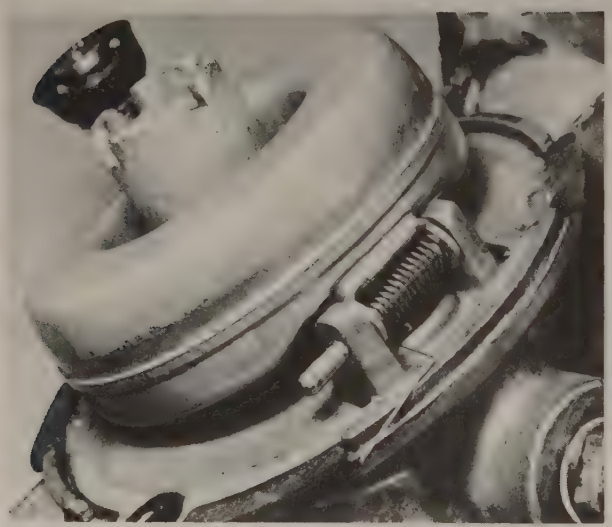
1 *Nut*
2 *Plain washer*
3 *Pulley*
4 *Return spring*
5 *Throttle cable abutment*
6 *Screw/washer*
7 *Throttle stop screw*
8 *Spring*
9 *Idle mixture screw*
10 *Spring*
11 *Screw/washer*
12 *Choke cable bracket*
13 *Throttle pump stroke adjuster screw*
14 *Screw*
15 *Spacer clip*
16 *Float pivot*
17 *Grub screw*
18 *Float*
19 *Low speed jet*
20 *Main nozzle*
21 *Main jet*
22 *'O' ring*
23 *'O' ring*
24 *Needle clip*
25 *Float needle*
26 *Float bowl*
27 *Screw/washer - 4 off*
28 *Throttle pump rod*
29 *Boot*
30 *'O' ring - 2 off*
31 *Diaphragm*
32 *Spring*
33 *Accelerator pump cover*
34 *Screw*
35 *Overflow tube*
36 *Clip - 2 off*
37 *Union*
38 *'O' ring*



6.1 Unscrew idler tube from carburettor top

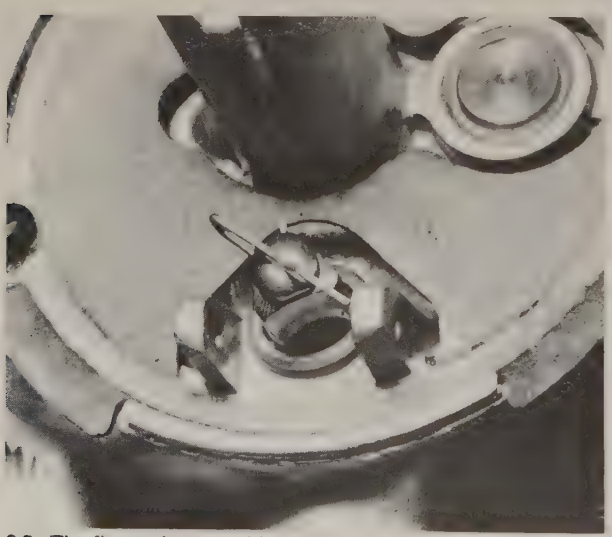


6.2 Remove the main jet from float bowl

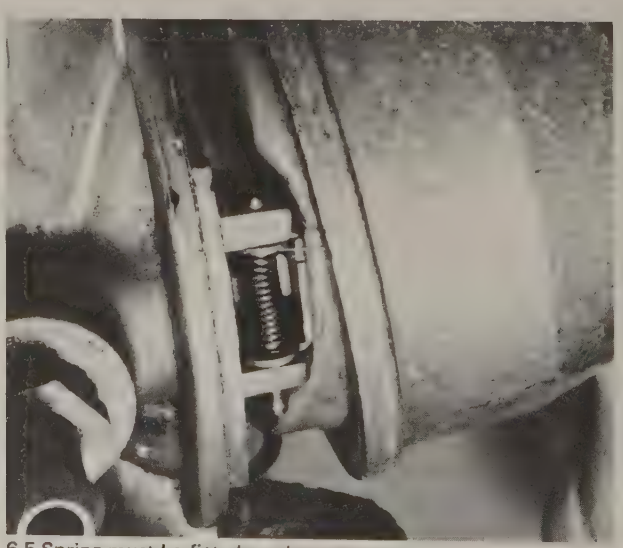


6.3a Pull out pin to release float ring

6.3b Note position of damper spring



6.3c The float valve assembly



6.5 Spring must be fitted, as shown, on reassembly

## 7 Carburettor: cleaning

1 The carburettor is a delicate, finely calibrated instrument and as such, care should be taken when cleaning the internal components. Clean blocked jets and air passageways with compressed air, **never** use wire or any other pointed tool as this may enlarge the orifices, causing permanent damage.
2 The dark varnish which builds up on both the internal and external components may be removed using paint stripper.

## 8 Carburettor: adjustments

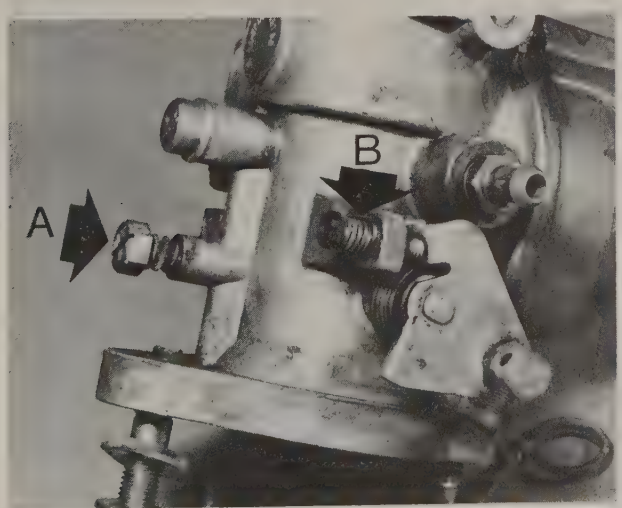
1 Make sure the engine is at normal working temperature before attempting any of the carburettor adjustments. The air cleaner must be in position when adjustments of any kind are made, since its absence will have a pronounced effect on carburation.

### *Bendix type 16P12 carburettor only (Pre 1976 models)*

2 Before adjusting the carburettor, the float level must be checked and if necessary, adjusted to the correct setting. The setting is correct if, when the carburettor is inverted, the lower surface of the float is 3/16 inch from the carburettor gasket surface. If adjustment is required, bend the float tang, using long nose pliers.
3 Run the engine until it reaches normal working temperature, then stop. Screw the idle speed needle inwards until it seats lightly, then back it off 1½ turns. Adjust the engine speed by means of the throttle stop screw until it runs at 700 - 900 rpm with the twist grip closed.
4 Re-adjust the idle speed needle, so that the engine will run accelerate and run smoothly at idle speed. If necessary, make a final adjustment with the throttle stop screw to obtain the desired 700 - 900 rpm idle.

### *Keihin carburettor (models 1976 on)*

5 As with the Bendix carburettor the float level must be checked and if necessary reset, before readjustment of the carburettor is required. This is, of course, not necessary in routine adjustment, but only after the carburettor has been dismantled or if problems have arisen due to flooding or fuel starvation. As can be seen from the accompanying diagrams, the float level must be set in two positions, in the fully open, and the fully closed position. Adjustment is made by bending the tongues of the float arm with a pair of pliers.
6 Carburettor adjustment is the same as that described for the Bendix instrument.




8.2 A = idler mixture screw, B = throttle stop screw

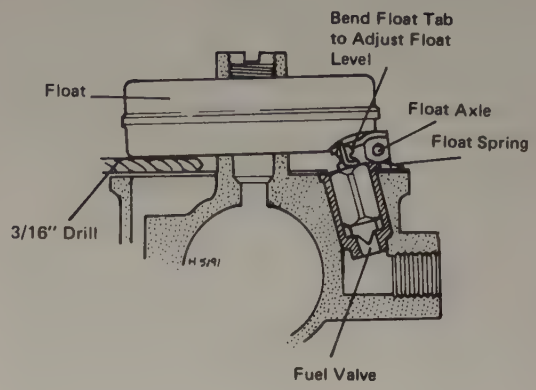



Fig. 4.3. Checking the float level (Bendix carburettor)

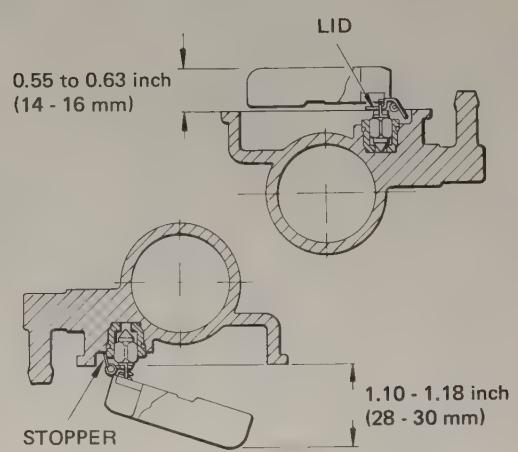



Fig. 4.4. Carburettor float setting - Keihin carburettor

## 9 Carburettor settings

1 Some of the carburettor settings, such as the sizes of the jets and the internal passageways are pre-determined by the manufacturer after extensive tests. Under normal circumstances, it is unlikely that these settings will require modification. If a change appears necessary, it can often be attributed to a developing engine fault.
2 Always err slightly on the side of a rich mixture, since a weak mixture will cause the engine to overheat. Reference to Chapter 5 will show how the condition of the spark plug electrodes can be interpreted as a reliable guide to carburettor mixture strength with some experience.

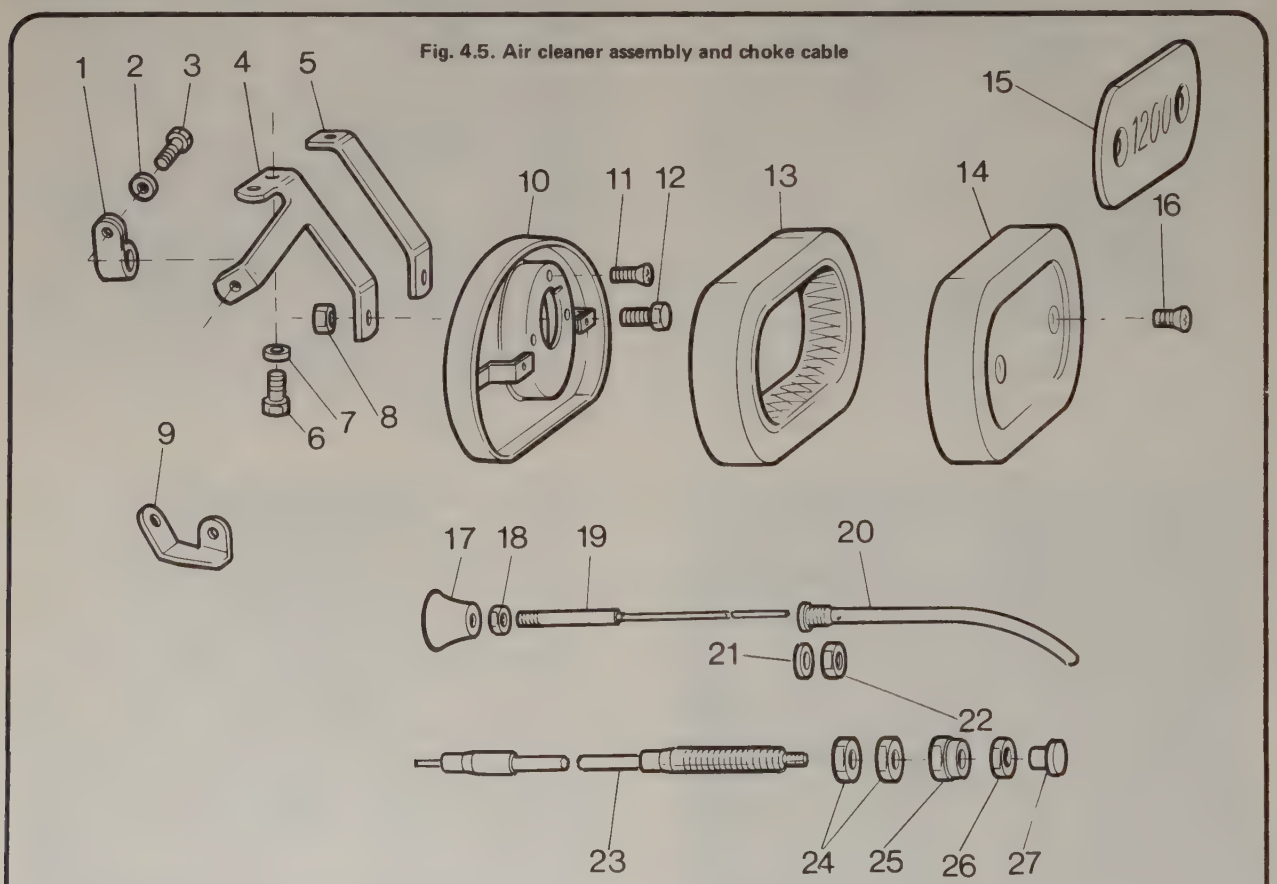
### 10 Carburettor faults

1 Before suspecting the carburettor as the cause of developing troubles, it is wise to verify the accuracy of the ignition timing and, if the engine has been dismantled previously, the valve timing. An error in either setting can give symptoms which may prove misleading.
2 The accelerator pump will give trouble if the spring loaded leather cup is damaged. Poor acceleration will be evident if the accelerator pump is not functioning correctly.
3 The carburettor will give trouble if the float level is not correct and this is the first item to check. Most other problems will be caused by dirt in the internal passageways or by a defective accelerator pump unit, which will have to be renewed.
4 On some Keihin instruments, particularly the earlier models, problems may be encountered in maintaining a tick-over within the prescribed limits when the engine is at full working temperature. This may be caused by slight air leakage around the welch plug inserted in the top of the carburettor or by similar leakage around the pilot air screw. A sealing compound judiciously applied usually cures the problem. If the symptoms continue, it may be due to the flow of heat to the carburettor from the inlet manifold. The manufacturer can supply a heat-sink block which is fitted between the carburettor and the manifold. This will require the use of two extra long carburettor mounting studs.

### 11 Air cleaner: removing and replacing the element

1 In order to gain access to the air cleaner element, it is first necessary to remove the plated, ribbed cover which is retained to the main body of the assembly by two crosshead screws. This will expose the element and screen.
2 All models have a plastic foam air cleaner element, which should be removed from the protective screen and washed in a non-flammable solvent. It should then be allowed to dry prior to immersion in clean engine oil. Allow it to soak until the element is uniform in colour, if necessary working in the oil with the hands and fingers. When the excess oil has drained off, replace the element on the screen so that the three grooves face towards the screen. Refit the cover and the two retaining screws.
3 Never run the machine without the air cleaner attached or without the air cleaner element. The carburation is set up to take into account the presence of the air cleaner and will be seriously weakened if the settings are not changed to compensate.
4 It follows that a clogged or split air cleaner element will also have adverse effects on the carburation and on the engine itself. It is preferable to give the air cleaner more frequent attention than is necessary rather than to neglect it altogether. It is an item that should not be ignored during the normal routine maintenance.

**Fig. 4.5. Air cleaner assembly and choke cable**




| | | | | | |
|---|---|---|---|---|---|
| *1 Choke cable clip - FL/FLH* | *8 Nut* | *14 Cover* | *21 Washer* |
| *2 Spring washer* | *9 Bracket* | *15 Trim* | *22 Nut* |
| *3 Screw* | *10 Air cleaner box backplate* | *16 Screw - 2 off* | *23 Choke cable - FL/FLH* |
| *4 Support bracket - FL/FLH* | | *17 Choke knob - FX* | *24 Nut - 2 off* |
| *5 Support bracket - FX* | *11 Screw - 3 off* | *18 Nut* | *25 Sleeve nut* |
| *6 Bolt* | *12 Bolt* | *19 Cable - FX* | *26 Nut* |
| *7 Spring washer* | *13 Air filter element* | *20 Cable outer - FX* | *27 Choke knob - FL/FLH* |

## 12 Exhaust system

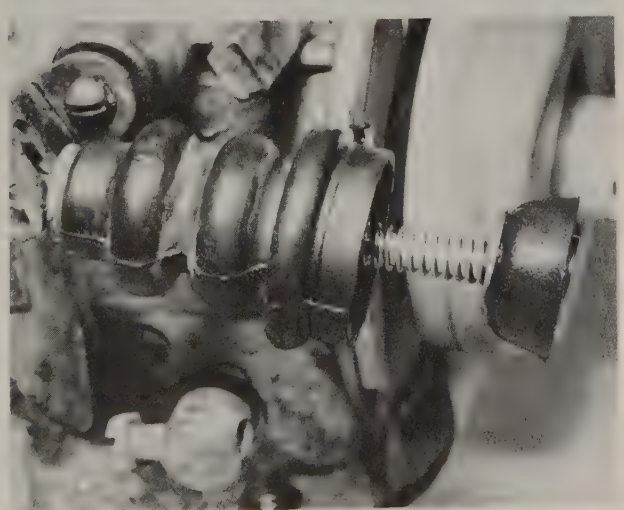
1 Unlike a two-stroke, the exhaust system does not require such frequent attention because the exhaust gases are usually of a less oily nature. For this reason, no provision is made for detaching the baffles of the silencers as they are unlikely to become obstructed.
2 Do not run the machine with a defective silencer or with silencers from which the baffles have been removed or modified. Although the changed exhaust note may create the illusion of greater speed, in most cases performance will actually be impaired. This also applies if silencers of a type not designed for the machine are fitted.
3 It is important that the exhaust pipes are a tight fit at the exhaust outlet stub and where they enter the silencer. An air leak at either place will cause a mysterious backfire on the overrun, which often proves difficult to eliminate without knowing the cause.

## 13 Engine lubrication

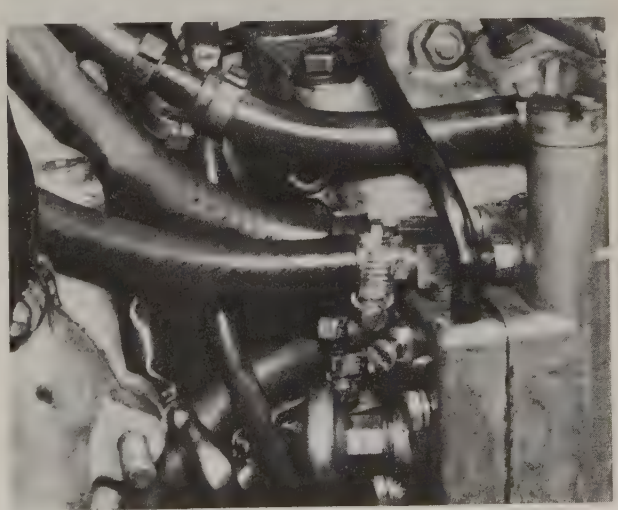
1 The engine lubrication system works on the dry sump principle, in which oil is drawn from the side mounted oil tank and force-fed to the major engine components by means of a gear-type oil pump housed below the right-hand crankcase and driven from the right-hand end of the crankshaft. All surplus oil drains back into the crankcase, from whence it is picked up by the scavenge section of the pump and returned to the oil tank, for re-use. It is, therefore, a full circulating system.
2 Oil is fed under high pressure to the big-end bearings by an internal oil way, and to the rocker assemblies and valves by external pipes. A low pressure or vapour feed is supplied to all other working parts of the engine, either internally or by small diameter hoses. The high pressure feed also supplies the four hydraulic tappets. An unusual feature of the oil system is the lubrication of the primary drive assembly. Engine oil is supplied directly to the casing by a hose connected with the oil pump. Return of the oil is controlled by crankcase vacuum during certain phases of the engine rotation.

## 14 Removing the oil pump

1 Unless absolutely necessary the oil pump should not be dismantled. The working components of the oil pump are thoroughly lubricated, in consequence wear is progressive and occurs slowly over a long period. Damage to the pump is usually caused by hard metal or carbon particles passing through the meshing gears and causing scoring or chipping of the teeth. In extreme cases the gears may jam, causing the gear driveshaft key to shear.
2 The oil pump can be removed as a complete unit when the engine has been lifted from the frame. This procedure is detailed in Chapter 1, Section 12. Removal of the pump whilst the engine is in the frame may be carried out by detaching the individual components consecutively leaving the driveshaft in the casing. Whichever method is employed, it is important that the pump gears are marked so that they may be replaced in their original positions, to maintain the original clearances and assist bedding-in.
3 To gain access to the oil pump, the right-hand front footrest must be detached complete with the mounting bracket. Additional working space may be gained by removal of the exhaust system (Electra Glide) although this is not imperative.
4 Commence oil pump removal by disconnecting the main feed pipe from the oil tank to the pump body. As with the other pipes it is secured at the union by a crimped aluminium clip which may be loosened, using the blade of a screwdriver. Unless the oil tank has been drained it will be necessary to plug the pipe end immediately on disconnection, to prevent the flow of oil from the reservoir. A short bolt of suitable diameter makes an ideal plug. Disconnect the remainder of the hoses and also the oil pressure switch lead at the switch terminal.
5 Loosen the four bolts which pass through the pump body and the two nuts. These must be slackened evenly, to prevent distortion of the cover. Remove the bolts and remove the pump cover and plastic gasket. The exposed gears provide the oil feed pressure. Detach the circlip from the end of the driveshaft and withdraw the drive gear and Woodruff key. Keep the gear and key as a set. Remove the driven gear from the idler shaft. Remove the final two nuts and washers and pull the pump body off the driveshaft and scavenger drive gear. Withdraw the drive gear and key, keeping them as a set, followed by the driven gear.
6 Removal of the pump driveshaft is rarely necessary, it being required only if the drive key at the timing chest end has sheared. This may be checked by rotating the engine and confirming that the shaft is driven consistently.
7 Unscrew the large plug from the top of the pump body and remove the pressure regulating valve cup and spring. Remove the smaller plug and the spring and steel ball of the anti-syphon valve. Unscrew the plug from the rear of the pump body.
8 Unscrew the rear chain oiler adjusting screw from the pump cover. If the screw was set correctly for oil feed, count the number of turns of the screw on removal, to aid reassembly.



10.3 Check accelerator pump piston for disintegration



14.2 Oil pump feed pipe connections

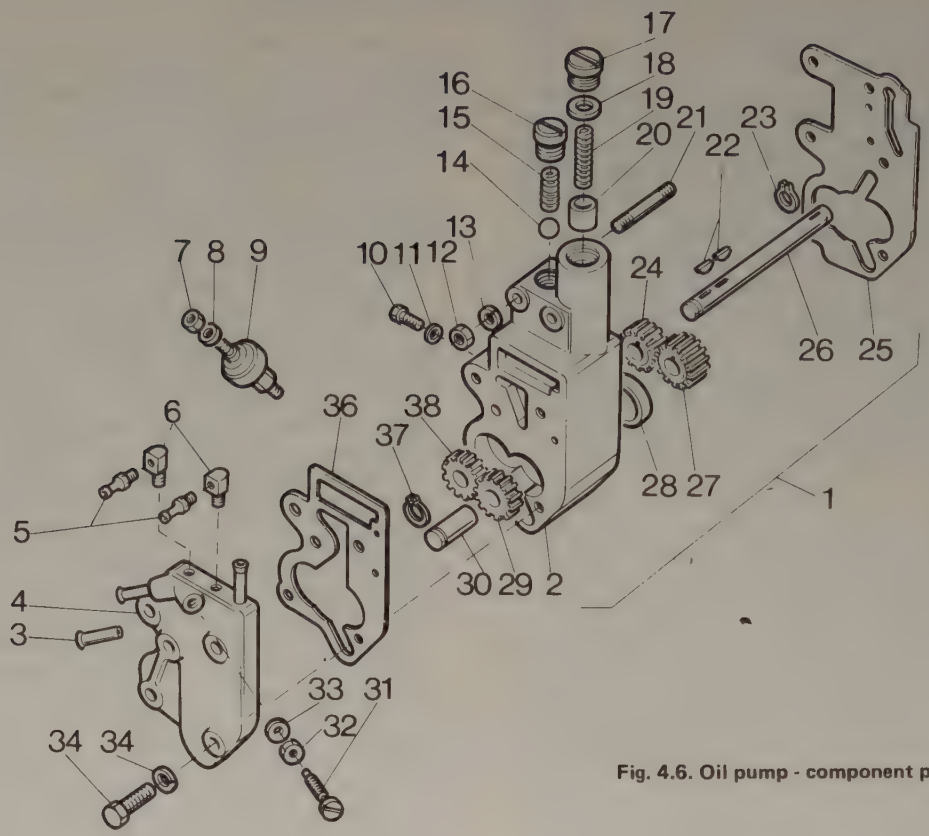
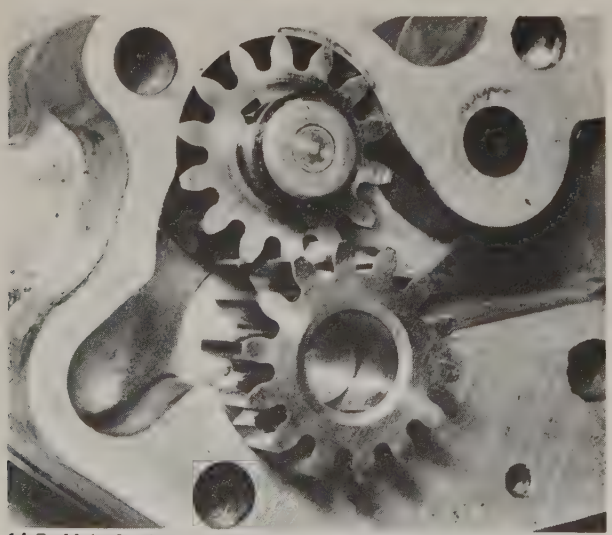
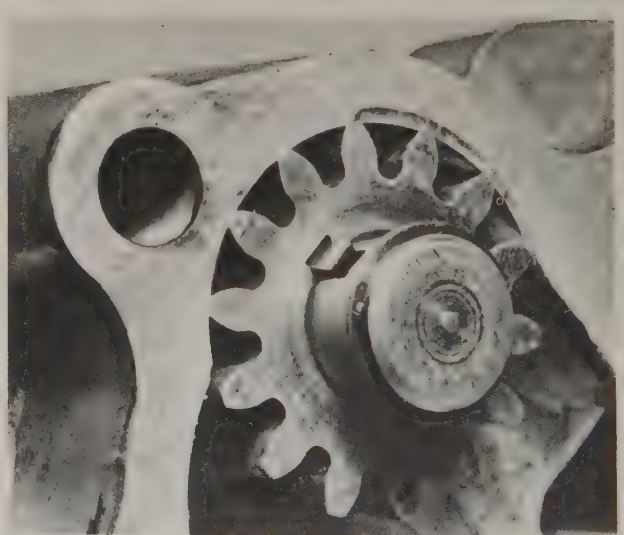



**Fig. 4.6. Oil pump - component parts**

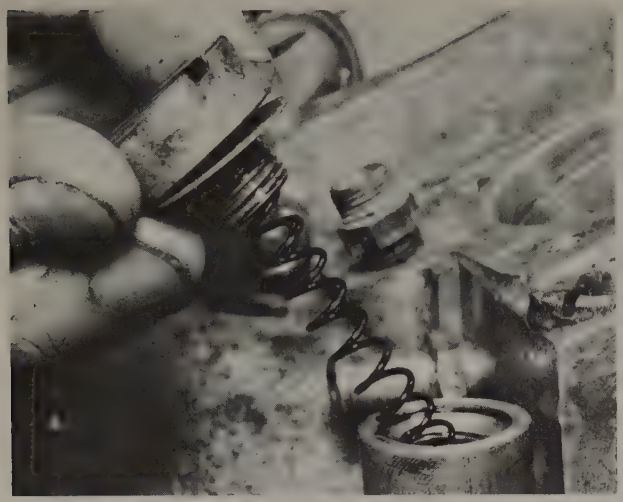
1 *Oil pump*
2 *Oil pump body*
3 *Union*
4 *Pump cover*
5 *Union - 2 off*
6 *Union elbow - 2 off*
7 *Nut*
8 *Washer*
9 *Oil pressure lamp switch*
10 *Blanking plug*
11 *Washer*
12 *Nut - 2 off*
13 *Spring washer*
14 *Anti-syphon ball valve*
15 *Spring*
16 *Plug*
17 *Plug*
18 *Sealing washer*
19 *Spring*
20 *Pressure control plunger*
21 *Stud - 2 off*
22 *Key - 2 off*
23 *Circlip*
24 *Scavenge drive pinion*
25 *Gasket*
26 *Oil pump driveshaft*
27 *Scavenge driven pinion*
28 *Oil seal*
29 *Feed driven pinion*
30 *Shaft*
31 *Chain oiler adjuster*
32 *Locknut*
33 *Brass washer*
34 *Bolt - 4 off*
35 *Spring washer - 4 off*
36 *Gasket*
37 *Circlip*
38 *Main feed drive pinion*

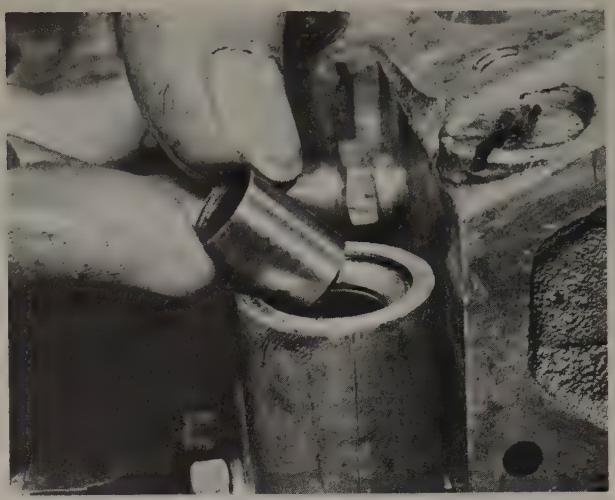


14.5a Main feed gear pinions

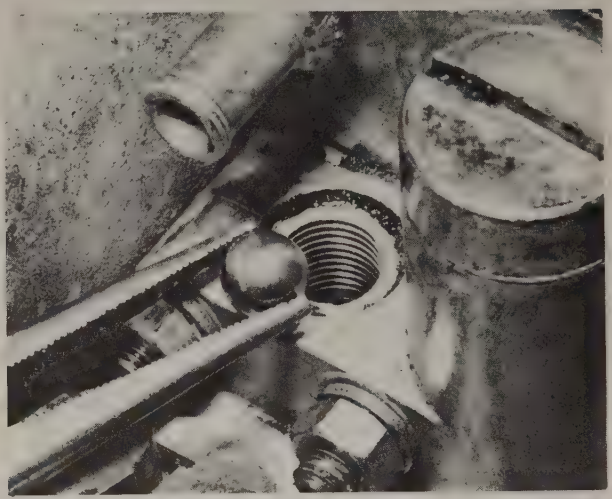


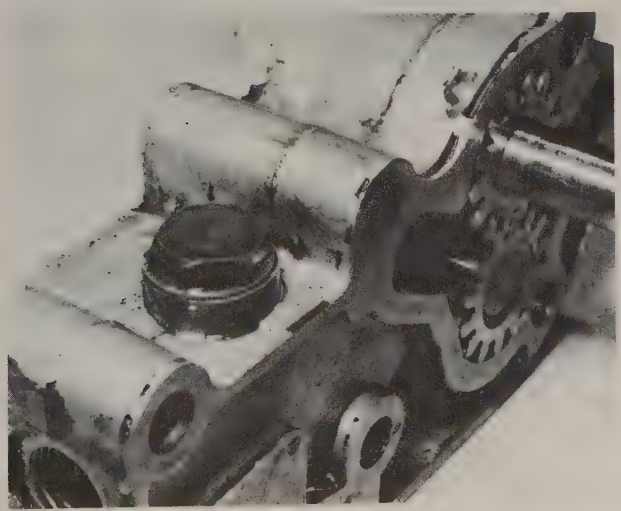
14.5b Each drive gear is located by a Woodruff key


14.7a Unscrew large plug to gain access to ...


14.7b ... the pressure regulating valve plunger

14.7c Smaller screw plug retains ...


14.7d ... the anti-syphon ball valve


14.7e Remove blanking plug to aid cleaning

## 15 Oil pump: examination and renovation

1 Clean the pump component parts thoroughly in petrol and allow them to dry. Blow out the oil passages in the pump body and cover to ensure complete removal of all oil and any obstructions.

2 Inspect the pump gears for scoring or fractured teeth. If this or wear is evident, the gears should be renewed. Intermeshing gears must always be renewed as a set. Check that the keys are a good sliding fit in the gear and shaft keyways. Although slight play in the drive is permissible, the condition may indicate general wear.

3 Inspect the release valves and their seatings for pitting or other damage. Damaged seats cannot be reclaimed easily and a new pump body should therefore be fitted.

4 Leakage of oil at the cover/pump body joint, and more rarely at the pump/timing chest joint, is not unusual. This condition is usually due to unevenly tightened or over-tightened bolts causing distortion. Due to the small area of the mating surfaces, only a small amount of distortion will cause leakage. If the pump cover is distorted, a small amount of

material may be removed by rubbing the component on a perfectly flat surface upon which is spread a sheet of very fine (No. 400 - 600) emery paper. A face plate or plate glass (not window glass) surface is ideal for the grinding operation. This method cannot be adopted for use on the pump body. It will be seen that removal of material from either mating surface will reduce the pump gear end clearance. At best this will destroy the manufacturers tolerances, at worst the gears will become locked.

5 Leakage of oil at the two angled unions on the pump body may be rectified by unscrewing the unions and applying a sealant to the threads. Do not apply too much sealant as there is a danger of oilway blockage.

### 16 Refitting the oil pump

1 Reassemble the pump by reversing the dismantling procedure using new gaskets, and a new oil seal and circlip. All parts must be thoroughly cleaned in petrol and lightly oiled prior to reassembly. It is particularly important that each gasket is checked to ensure it does not mask off any oilways or obstruct the free movement of the gear pump pinions. **Do not use gasket cement at any of the joints.** Tighten the pump a little at a time during reassembly and check that it revolves quite freely at each stage.

2 Jamming of the pump on reassembly can often be traced to the new gaskets fouling the teeth of the gears. Using a sharp knife, relieve the gasket where required, until clearance is gained. Do not overtighten the oil pump retaining nuts and bolts. The plastic gasket material will squeeze out under excessive pressure and prevent correct sealing. The recommended torque for the bolts and nuts is 50 - 60 in lbs (4 - 5 ft lbs).(0.553 - 0.691 kg m).

### 17 Oil filters: location and cleaning

1 The main oil filter is of the cartridge type within the side mounted oil tank, to which access can be gained when the filler cap is removed and the retaining spring is released from the top of the filter assembly. For cleaning, the filter element should be lifted out and washed in solvent before it is allowed to dry and be replaced. It should be cleaned whenever the oil is changed and certainly not less frequently than every 2,000 miles. After the machine has covered 5,000 miles, the filter element should be renewed and the old element discarded.

3 When replacing the element, make sure the 'O' ring is positioned correctly on the filter cup flange. The correct order of assembly within the outer cup is: cup seal, spring, lower retainer, filter element, cap seal washer and retaining clip.

4 A small conical mesh filter is fitted in the top of the timing chest, to prevent small particles of foreign matter from entering the hydraulic tappets, and blocking the tiny feed and bleed orifices. To gain access to the filter, unscrew the plug recessed in the top of the timing cover to the rear of the rear cylinder cam followers guide block. Lift out the spring and screen. The screen should be cleaned in petrol and allowed to dry. Ensure that the filter is refitted with the open end facing downwards.

### 18 Oil pressure switch

1 The oil pressure switch that screws into the front of the pump body is connected to an oil warning lamp, which is extinguished when engine speed reaches about 20 mph in top gear. If it fails to go out, check the switch before suspecting oil pump failure. It will be necessary to employ a substitution technique, since a defective switch cannot be repaired. The oil pressure is not adjustable.

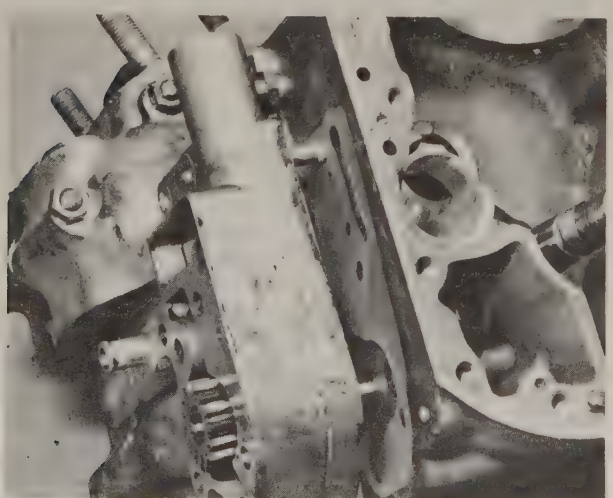
2 Never run the engine with a defective pressure switch or when the oil warning lamp is on as there is grave risk of causing serious engine damage. Always trace the cause of the fault and make sure it is remedied, before re-starting.

3 The warning lamp bulb is checked each time the ignition is switched on, as it will light up until the engine is started and sufficient oil pressure builds up to extinguish it.

### 19 Checking the oil pressure

1 Although there is no built-in provision for checking the oil pressure, an oil pressure gauge can be fitted temporarily if the oil pressure switch is removed and the gauge connection is made in its place.

2 Under normal running conditions, with the engine at working temperature, the oil pressure should be withing the range 12 - 35 psi.



16.1 Always use new plastic gaskets on reassembly

17.1 Main oil filter is contained in tank, within a canister

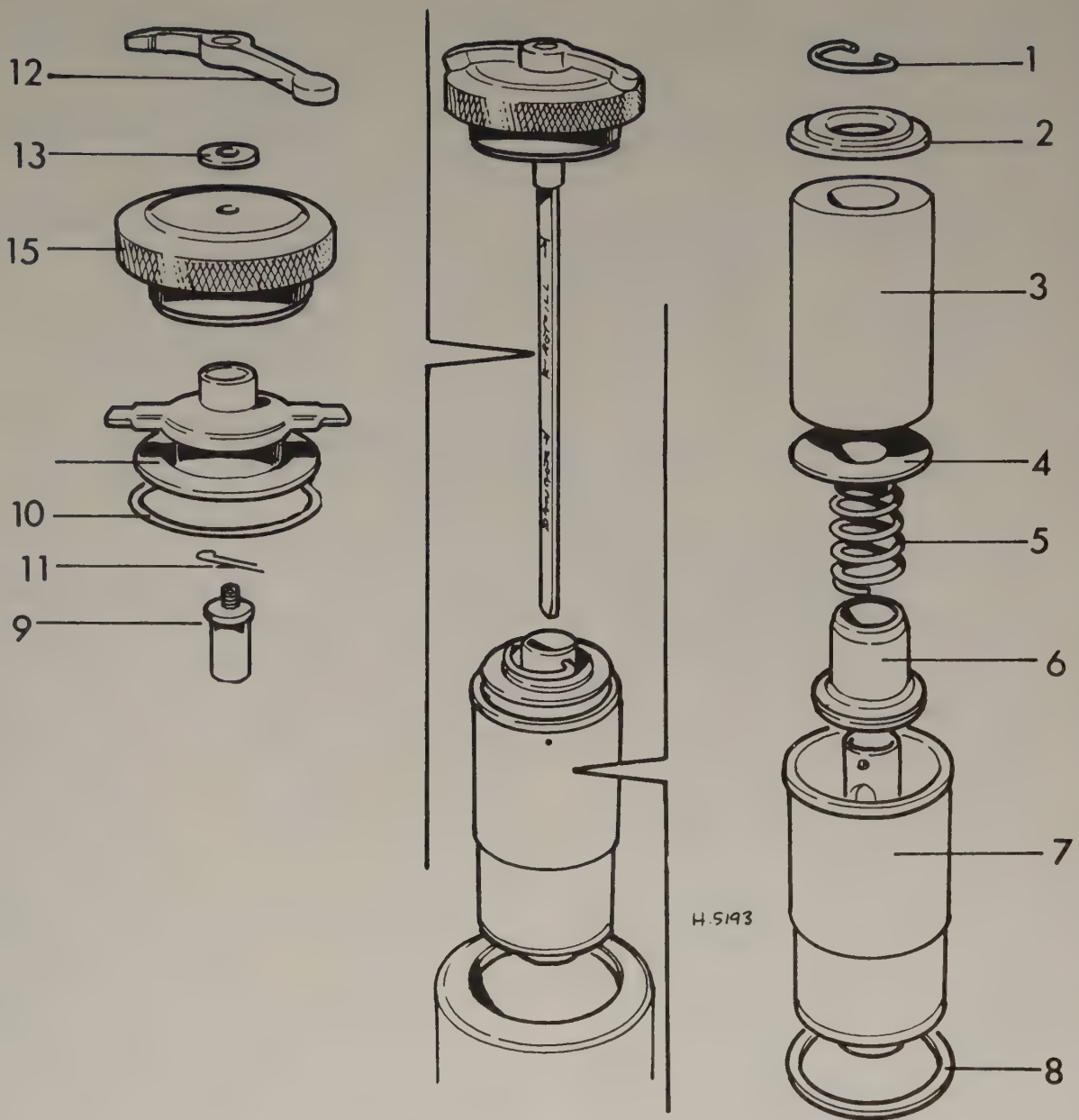



**Fig. 4.7. Oil tank filter unit**

1 *Filter clip*
2 *Cap seal washer*
3 *Filter element (renewable)*
4 *Filter lower retainer*
5 *Cup spring*
6 *Cup seal*
7 *Cup*
8 *'O' ring seal*
9 *Valve assembly*
10 *Cap gasket*
11 *Cap split pin*
12 *Cap screw*
13 *Cap washer*
14 *Cap nut*
15 *Cap top*

**20 Fault diagnosis: fuel system and lubrication**

| Symptom | Cause | Remedy |
|---|---|---|
| Engine gradually fades and stops | Fuel starvation | Check vent hole in filler cap. Sediment in filter bowl or blocking float needle. Dismantle and clean |
| Engine runs badly. Black smoke from exhausts | Carburettor flooding | Dismantle and clean carburettor. Check for punctured float or sticking float needle |
| Engine lacks response and overheats | Weak mixture<br>Air cleaner disconnected<br>Modified silencers have upset carburation | Check for partial blockage in carburettor.<br>Reconnect.<br>Replace with originals. |
| Engine loses power and gets noisy | Lubrication failure | Stop engine immediately and do not re-run until fault is located and remedied. |

# Chapter 5 Ignition system

**Contents**


General description ... 1
Ignition coil: checking ... 2
Contact breaker: adjustments ... 3
Contact breaker points: removal, renovation and replacement ... 4
Condenser: removal and replacement ... 5
Ignition timing: checking and resetting ... 6
Ignition timing: checking by stroboscope ... 7
Automatic advance unit: examination ... 8
Spark plugs: checking and resetting the gaps ... 9
Fault diagnosis: ignition system ... 10


**Specifications**

## Ignition system

| | |
|---|---|
| Make | Single contact breaker, twin coil. |
| Contact breaker gap | 0.016 - 0.020 in (0.40 - 0.50 mm) |

## Ignition timing

| | |
|---|---|
| Retarded | 1/64 in 5° BTDC |
| Full advance | 7/16 in 35° BTDC |
| Dwell angle | 140° @ 2000 rpm |

## Spark plugs

| Make | Champion | Motocraft | Harley-Davidson |
|---|---|---|---|
| Type: | | | |
| 1973-74 | J-12Y-MC | A42 | No. 3-4 |
| 1975 on | N-12Y-MC | AG42 | No. 5-6 |
| Gap | 0.025 - 0.030 in (0.65 - 0.75 mm) | | |
| Reach | 3/8 in pre-1974 models, ¾ in post-1975 models | | |

## 1 General description

The ignition system comprises an ignition coil (supplying both cylinders) which draws current from the battery, the latter being maintained in a fully charged condition by the engine driven alternator. A contact breaker assembly is interposed in the primary electrical circuit to interrupt the flow of current when a spark is required at either spark plug to ignite the petrol/air mixture that is under compression. The resultant explosion drives the piston downwards, to initiate the rotary motion of the crankshaft assembly, which in turn provides the drive. The exact point at which the spark will occur is determined by the position of the contact breaker points in relation to a revolving cam, which will cause them to separate and then re-make contact. Provision is included for varying the point at which separation occurs, whilst the engine is running, so that the position is advanced as the engine speeds up. This function is controlled by an automatic advance unit which lies below the contact breaker assembly and is attached to the contact breaker cam.

When the contact breaker points separate and the flow of electricity in the primary circuit is broken, a high tension voltage is induced in the secondary windings of the ignition coil that forms part of the same circuit. This voltage is fed direct to the spark plug and is sufficient to jump the air gap between the plug electrodes and ignite the petrol/air mixture.

A condenser is included in the contact breaker circuit to help intensify the spark and to prevent the contact breaker points from arcing as they separate. Both spark plugs fire at the same time, but only one impulse is effective since only one cylinder will be on compression.

## 2 Ignition coil: checking

1 The ignition coil is mounted on the frame down tube to the left of the rear cylinder and is protected by a chromed cover. It is constructed as a sealed unit, designed to give long, reliable service without need for attention. If difficult starting, a persistent misfire or a weak spark causes the performance of the coil to be suspect, it should be checked by a Harley-Davidson specialist or an auto-electrical expert. A faulty coil must be renewed; it is not possible to effect a satisfactory repair.
2 A defective condenser will sometimes give almost identical symptoms and is likely to occur more frequently. For this reason it is always advisable to investigate the condition of the condenser in the contact breaker assembly before condemning the coil.
3 An ignition coil is most likely to suffer damage if it is crushed or receives a heavy blow, which will cause the thin gauge winding within to fracture. It may also burn out if the machine is left stationary with the ignition switched on, as a result of the heat build-up.

## 3 Contact breaker: adjustments

1 On all models, the contact breaker assembly is housed within the timing cover, behind a circular detachable cover plate retained by two screws. There should be a gasket immediately behind this cover, to prevent the ingress of water that would otherwise render the assembly inoperative.
2 Remove the cover and gasket and rotate. Rotate the engine until the contact breaker points are in the fully open position. Note that the points operating cam has two lobes of differing sizes. All points adjustment must be made with the moving contact rubbing block in the centre of the larger lobe. Rotation of the engine can be carried out by means of the kickstart. If a kickstart is not fitted, the machine should be placed in top gear and wheeled backwards or forwards as necessary. Inspect the condition of the points faces. If they are only slightly soiled the faces may be cleaned using a fine swiss file or emery paper (No. 400) backed by a thin strip of tin. Badly blackened or burned points should be removed for further attention or for renewal as described in Section 4 of this Chapter. Using a feeler gauge check that the points gap is within the range 0.016 - 0.020 in (0.4 - 0.5 mm).
3 If the gap is incorrect, loosen the contact breaker securing screw and move the fixed contact point near to or further away from the moving point, until the blade of the feeler gauge is a light sliding fit. Tighten the centre screw and recheck the gap. The points must be in the fully open position during adjustment or a false reading will result. After initial adjustment rotate the engine further until the points are again fully open with the rubbing block on the smaller (narrower) of the two cam lobes. Check the gap again. The larger lobe operates the contact breaker for the rear cylinder and the small cam for the front. If the gap varies between the two lobes by more than 0.004 in (0.10 mm) a worn cam or eccentrically mounted automatic advance unit is indicated. To check for concentricity, loosen the contact breaker cam centre bolt and move the cam and automatic advance unit towards the cam lobe giving the widest points gap. Movement is limited to the amount of play between the advance unit recess and the drive boss projecting from the valve drive camshaft with which it engages. Tighten the centre bolt and reset the contact breaker points. If this means of correcting eccentricity does not prove satisfactory, the cam must be renewed.

*1 Contact breaker cover screws - 2 off*
*2 Contact breaker cover*
*3 Contact breaker cover gasket*
*4 Low tension terminal and lead*
*5 Contact breaker cam retaining bolt*
*6 Contact breaker baseplate screw - 2 off*
*6a Contact breaker baseplate screw - 2 off*
*7 Contact breaker baseplate screw lockwasher and washer - 2 off*
*8 Contact breaker baseplate assembly complete*
*9 Contact breaker cam*
*10 Automatic advance assembly*
*11 Points adjusting screw*
*12 Contact breaker points assembly*
*13 Contact breaker baseplate*
*14 Condenser, screw and lockwasher - 2 off*
*15 Condenser*
*16 Balance weight spring - 2 off*
*17 Balance weight - 2 off*
*18 Balance weight pin - 2 off*
*19 Cam stop pin*
*20 Register pin*
*21 Camshaft seal*

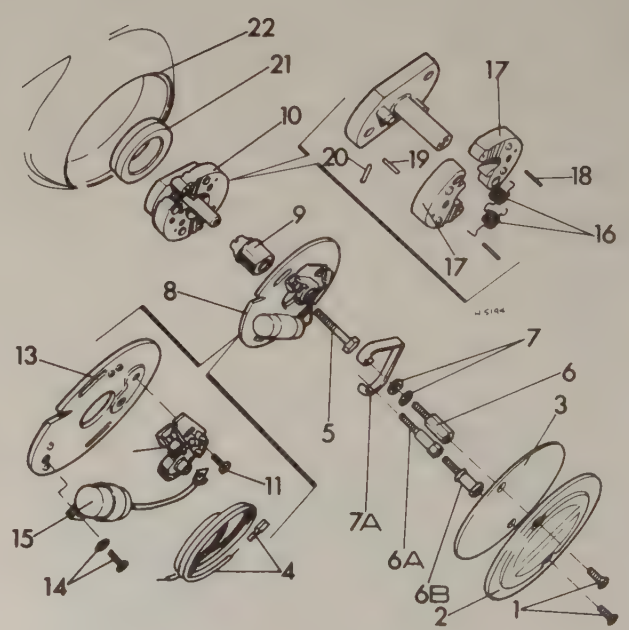
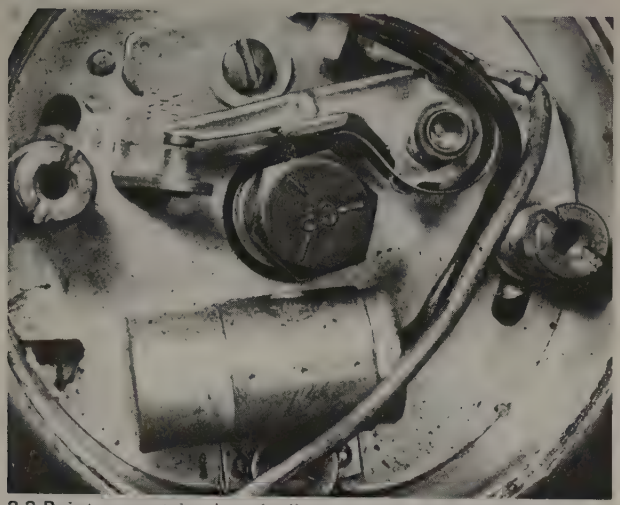



Fig. 5.1. Contact breaker assembly



3.3 Points are retained and adjusted by central screw

## 4 Contact breaker points: removal, renovation and replacement

1 If the contact breaker points are burned, pitted or badly worn, they should be removed for dressing. If it is necessary to remove a substantial amount of material before the faces can be restored, the points set should be renewed, without question. This also applies if the fibre heel that bears on the contact breaker cam is badly worn.
2 To remove the contact breaker assembly, remove the two screws that retain the base plate to the timing cover. It will also be necessary to detach the electrical lead. Lift off the base plate complete with the contact breaker points. Note that it is advisable to mark the base plate and the surround with a scribe line, prior to removal, so that the assembly can be replaced in exactly the same position. This will obviate the need to retime the ignition, on reassembly.
3 To remove the contact breaker, pull the condenser terminal from the terminal post, unhooking the moving contact point return spring at the same time. Lift off the moving contact point and release the fixed contact point by removing the single retaining screw through its base mounting. Note the arrangement of the insulating and other washers, to prevent them being replaced in the wrong order.
4 The points should be dressed with an oilstone or fine emery cloth. Keep them absolutely square throughout the dressing operation, otherwise they will make angular contact on reassembly and rapidly burn away.
5 Replace the contacts by reversing the dismantling procedure, making sure that the insulating washers are replaced in the correct order. It is advantageous to apply a thin smear of grease to the pivot pin, prior to replacement of the moving contact arm.
6 Check, and if necessary, re-adjust the contact breaker gap when the points are fully opened by both lobes of the cam.

## 5 Condenser: removal and replacement

1 A condenser is included in the contact breaker circuitry to prevent arcing across the contact breaker points as they separate. The condenser is connected in parallel with the points and if a fault develops, ignition failure is liable to occur.
2 If the engine proves difficult to start, or misfiring occurs, it is possible that the condenser is at fault. To check, separate the contact breaker points by hand when the ignition is switched on. If a spark occurs across the points and they have a blackened and burnt appearance, the condenser can be regarded as unserviceable.
3 It is not possible to check the condenser without the appropriate test equipment. In view of the low cost involved, it is preferable to fit a new replacement to observe the effect on engine performance.
4 Because the condenser and contact breaker assembly is common to both cylinders, it is highly improbable that a faulty condenser will give rise to a misfire on one cylinder only. In such a case it is advisable to seek the source of the trouble elsewhere, possibly in some other part of the ignition circuit.
5 The condenser is retained to the contact breaker base plate by means of a clamp and screw. If the electrical lead is detached and the screw removed, the condenser can be lifted away from the base plate assembly. When fitting a replacement condenser, note that the clip around the body forms the earth connection and must make good contact with the base plate. Tighten the retaining screw fully.

## 6 Ignition timing: checking and resetting

1 To check the ignition timing, first remove the cap with the hexagonal insert, in the left-hand crankcase side, between the two cylinders. Remove both spark plugs and telescope the push rod covers of the front cylinder. Remove the contact breaker cover and check that the points are correctly gapped when fully open.
2 Rotate the engine in a forward direction until the inlet valve of the front cylinder has closed completely, denoting the cylinder is now on the compression stroke. Continue turning slowly in the same direction until the scribe line on the flywheel rim is centrally disposed in the aperture in the crankcase wall, previously blanked off by the screw cap.
3 With the engine remaining stationary in this position, turn the contact breaker cam clockwise with light pressure, to ensure the automatic advance unit is in the fully advanced position. If the ignition timing is correct, the contact breaker points should be about to separate. If any adjustment is necessary, slacken the screws that retain the contact breaker base plate and rotate the whole assembly in the appropriate direction. Tighten the screws and recheck the setting. If the point of separation is difficult to see, slip a small piece of cigarette paper between the closed points. This type of paper has a thickness of about 0.002 in and if a steady pull is applied, it is easy to determine the exact point at which the grip is relaxed, as the points separate.
4 A more accurate check can be made by connecting a flash light bulb and battery across the points. The light will go out immediately the points separate, providing a more accurate visual indication.
5 Complete accuracy of the ignition timing is essential for optimum performance. It is important to ensure the points are correctly gapped before checking or resetting the ignition timing as adjustments made afterwards will affect the accuracy of the setting. Similarly, it is important to check that the automatic advance unit is in the fully advanced position by turning the cam as far clockwise as possible with light pressure. If this precaution is not observed, a very retarded setting will result, which may result in engine damage.

## 7 Ignition timing: checking by stroboscope

1 A stroboscope provides the best and most accurate means of checking the accuracy of the ignition timing, with the engine running. The stroboscope leads should be attached to the terminal of the front spark plug, to earth, and to the positive (red) battery terminal. It is best to replace the observation plug in the left-hand crankcase wall with one made of clear plastic, otherwise oil spray will create a problem whilst the engine is running, if the orifice is left unplugged.
2 Run the engine at approximately 2,000 rpm and observe the position of the timing marks through the transparent plastic cap. The accompanying diagram shows the acceptable range.

The rear cylinder mark is the single deeply drilled dot, which preferably, should line up with the front cylinder mark which is a vertical line.

Adjustments can be made if the contact breaker base plate screws are loosened sufficiently for the plate to be rotated by means of a screwdriver inserted in the slot provided.

**Fig. 5.2. Checking timing with strobe light**
Front and rear cylinder acceptable range of timing

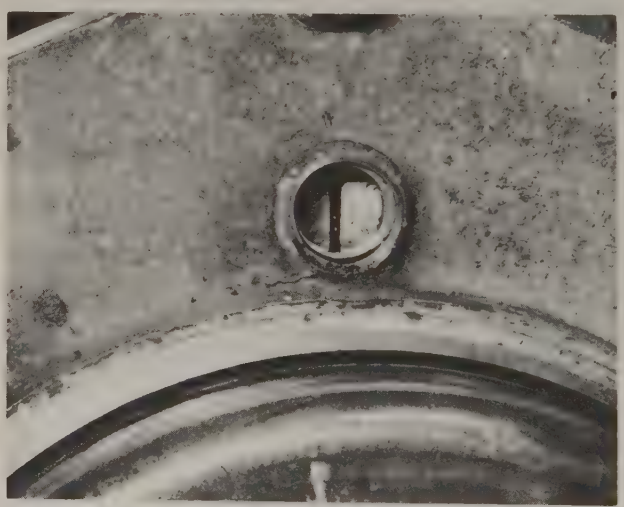
## 8 Automatic advance unit: examination

1 The automatic ignition advance mechanism rarely requires attention, although it is advisable to examine it periodically, when the contact breaker is receiving attention. It is retained by a bolt and washer through the centre of the contact breaker cam and can be pulled off the end of the camshaft when the contact breaker plate is removed.
2 The unit comprises spring loaded balance weights, which move outwards against the spring tension as the centrifugal force increases. The balance weights must move freely on their pivots and be rust-free. The tension springs must also be in good condition. Keep the pivots lubricated and make sure the balance weights move easily, without binding. Most problems arise as a result of condensation within the engine, which causes the unit to rust and balance weight movement to be restricted.
3 If the unit malfunctions or is suspect in any way, it is advisable to renew it, since repairs are usually impractical. The range within which the unit operates is critical and it is unlikely that anyone other than a Harley-Davidson specialist would have the appropriate repair and test equipment.
4 Replacement of the unit is simple, because it is manufactured in such a way that it can be reinserted in only one position. Before it is replaced, the condition of the oil seal below should be checked. If there is evidence of an oil leak, it should be renewed without question.
5 Recheck the accuracy of the ignition timing after reassembly, and adjust as necessary.

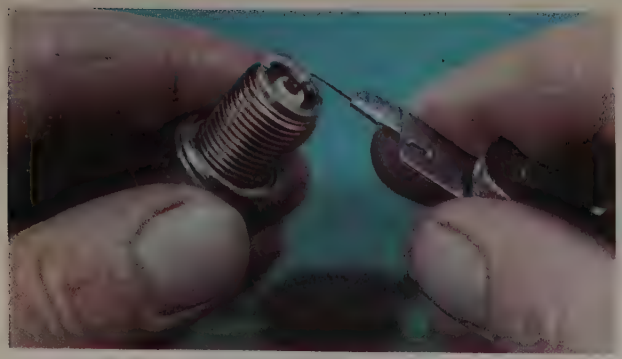
## 9 Spark plugs: checking and resetting the gaps

1 Always fit the proper grade of spark plug. See the Specifications for the proper grade. Any engine will only run really well on the correct grade of spark plug.
2 The recommended electrode gap is within the range 0.025 in - 0.030 in.
3 Check the gap at the plug points every 1,000 miles. To reset the gap, bend the outer electrode closer to the central electrode and check that a feeler gauge of the appropriate size can be inserted. Never bend the centre electrode, otherwise the insulator will crack, causing engine damage if particles fall in whilst the engine is running.
4 The condition of the spark plug electrodes and insulator can be used as a reliable guide to engine operating conditions. See accompanying diagrams.
5 Always carry a spare spark plug of the correct grade.
6 Never overtighten a spark plug, otherwise there is risk of stripping the threads from the cylinder head. A stripped thread can be repaired by using what is known as a Helicoil insert, a low cost service that is operated by a number of dealers.
7 Use a spanner that is a good fit, otherwise the spanner may slip and break the plug insulator. The plug should be tightened sufficiently to seat firmly on its sealing washer.
8 Make sure each plug insulation cap is a good fit and free from cracks. It is important that these caps are not omitted, for they contain an in-built suppressor that eliminates radio and TV interference.

6.3 Slacken screws to alter ignition timing



7.2a Front cylinder timing mark



**Spark plug maintenance:** Checking plug gap with feeler gauges

Altering the plug gap. Note use of correct tool

**Spark plug conditions:** A brown, tan or grey firing end is indicative of correct engine running conditions and the selection of the appropriate heat rating plug

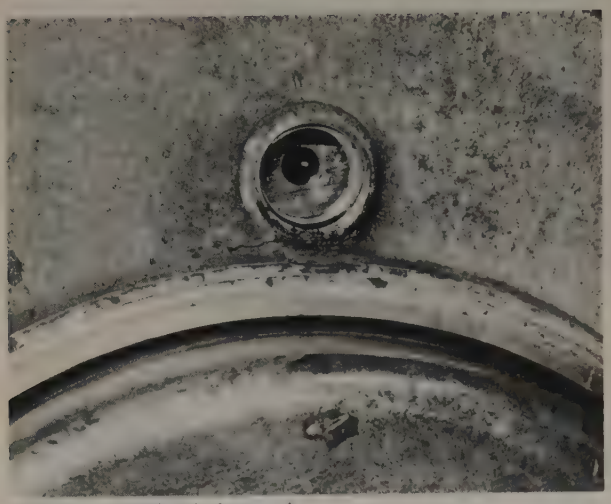
White deposits have accumulated from excessive amounts of oil in the combustion chamber or through the use of low quality oil. Remove deposits or a hot spot may form

Black sooty deposits indicate an over-rich fuel/air mixture, or a malfunctioning ignition system. If no improvement is obtained, try one grade hotter plug

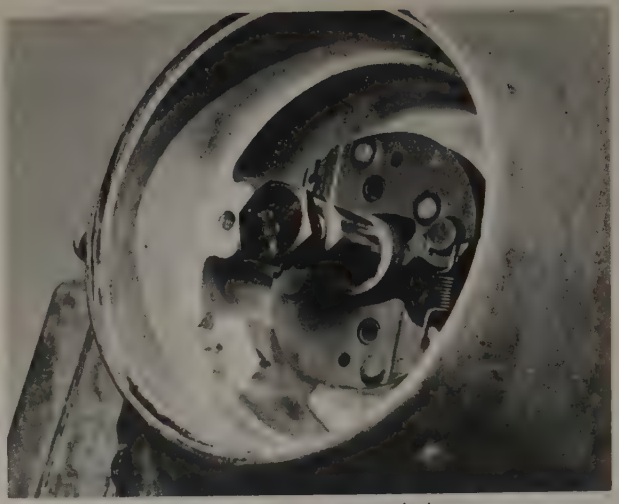
Wet, oily carbon deposits form an electrical leakage path along the insulator nose, resulting in a misfire. The cause may be a badly worn engine or a malfunctioning ignition system

A blistered white insulator or melted electrode indicates over-advanced ignition timing or a malfunctioning cooling system. If correction does not prove effective, try a colder grade plug

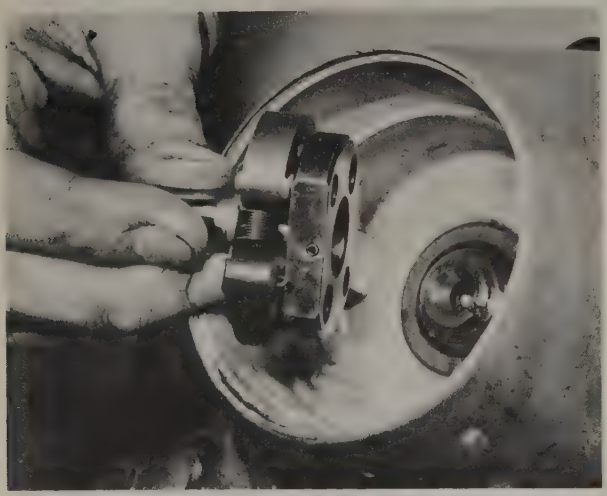
A worn spark plug not only wastes fuel but also overloads the whole ignition system because the increased gap requires higher voltage to initiate the spark. This condition can also affect air pollution



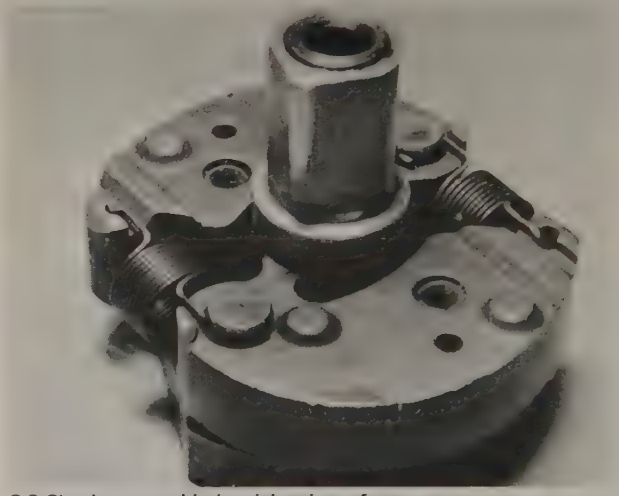
7.2b Rear cylinder timing mark



8.1a Cam and ATU is retained by a centre bolt



8.1b ATU locates with groove in camshaft end



8.2 Check cam and bobweight pivots for wear

**11 Fault diagnosis: ignition system**

| Symptom | Cause | Remedy |
|---|---|---|
| Engine will not start | Faulty ignition switch | Operate switch several times in case contacts are dirty. If lights and other electrics function, switch may need replacement. |
| | Starter motor not working | Recharge battery. |
| | Short circuit in wiring | Eliminate fault before switching on again. |
| Engine misfires | Faulty condenser in ignition circuit | Renew condenser and retest. |
| | Fouled spark plug | Renew plug and have original cleaned. |
| | Poor spark due to generator failure and discharging battery | Check output from alternator. Remove and recharge battery. |
| Engine lacks power and overheats | Retarded ignition timing | Check timing and also contact breaker gap. Check whether auto-advance mechanism has jammed. |
| Engine 'fades' when under load | Pre-ignition | Check grade of plugs fitted; use recommended grades only. Verify whether lubrication system has pressure. |

# Chapter 6 Frame and forks

**Contents**


General description ... 1
Front forks: removal from the frame ... 2
Front forks: dismantling the individual fork legs ... 3
Front forks: examination and renovation ... 4
Front forks: replacement ... 5
Steering head bearings: examination and renovation ... 6
Front forks: changing the damping oil ... 7
Adjustable front forks: altering trail angle ... 8
Frame: examination and renovation ... 9
Swinging arm fork: dismantling, examination and renovation ... 10
Rear suspension units: examination and renovation ... 11
Prop stand: examination ... 12
Footboards and footrests: examination and renovation ... 13
Rear brake pedal: examination and renovation ... 14
Dual seat: removal and replacement ... 15
Speedometer and tachometer heads: removal and replacement ... 16
Speedometer drive cable: examination and maintenance ... 17
Speedometer drive: location and examination ... 18
Sidecar alignment ... 19
Cleaning the machine ... 20
Fault diagnosis: frame and forks ... 21


**Specifications**

| Front forks | FL/FLH | FX/FXE |
|---|---|---|
| Oil capacity | | |
| After rebuild | 7/6 US/Imp. oz (206 cc) | 6/5 US/Imp. oz (177 cc) |
| After draining | 6.5/5.5 US/Imp. oz (192 cc) | 5/4 US/Imp. oz (148 cc) |
| Oil type | Harley-Davidson Type B, proprietary fork oil | |

## 1 General description

The Harley-Davidson models covered by this manual have a duplex tube frame of the full cradle type, with a single top tube running from the steering head to the saddle tube. Two smaller diameter tubes extend to the rear of the saddle tube, to form a support for the vertical members upon which the swinging arm fork and top rear suspension unit mountings are located. The various frame tubes are interconnected by massive forged lugs.

Conventional telescopic forks with one-way damping are fitted to all the models, the detail design differing from one type to another. The standard Electra Glide front fork is augmented by an adjustable version which allows a change in trail angle to be effected to suit the requirements of sidecar work. Super Glide models from 1976 on are fitted with a slightly modified fork, having a simpler damper arrangement.

Rear suspension on all models is provided by a swinging arm fork pivoting on taper roller bearings and supported by fully-adjustable hydraulically-damped rear suspension units.

## 2 Front forks: removal from the frame

1 It is unlikely that the front forks will have to be removed from the frame as a complete unit unless the steering head assembly requires attention or if the machine suffers frontal damage in an accident. The individual fork legs can be removed separately and dismantled if paragraphs 2 - 5, 7 - 8 and 12 of this Section are followed.

2 To remove the forks as a complete assembly, commence operations by blocking the machine up, so that it rests securely on a centre support, with the front wheel clear of the ground.

3 Remove the split pin (where fitted) and unscrew the front wheel spindle nut. Slacken the fork clamp nuts just sufficiently to release the hold on the wheel spindle. On Super Glide models the speedometer cable must be detached at the drive gearbox by unscrewing the knurled ring. In addition, on FX models after 1973, the brake caliper must be detached before the wheel can be removed. The caliper is held by a single nut and bolt. Take the weight of the wheel and carefully tap out the wheel spindle. Lower the wheel and remove it from between the front forks.

4 On all but late FX models, release the brake hose clip from the mudguard, where it is retained by a screw or bolt. Release also (where fitted) the clip holding the upper part of the hose to the front fork. Remove the four bolts which clamp together the two halves of the brake caliper. Pull the two halves apart, off the mounting bracket. Temporarily assemble the caliper unit. The complete assembly should then be tied to some convenient part of the machine so that it is out of the way and not likely to suffer damage from the operations to follow.

5 The mudguard can now be removed. It is held in position by two bolts passing into each fork leg.

6 Disconnect the battery to prevent shorting during removal of the wiring.

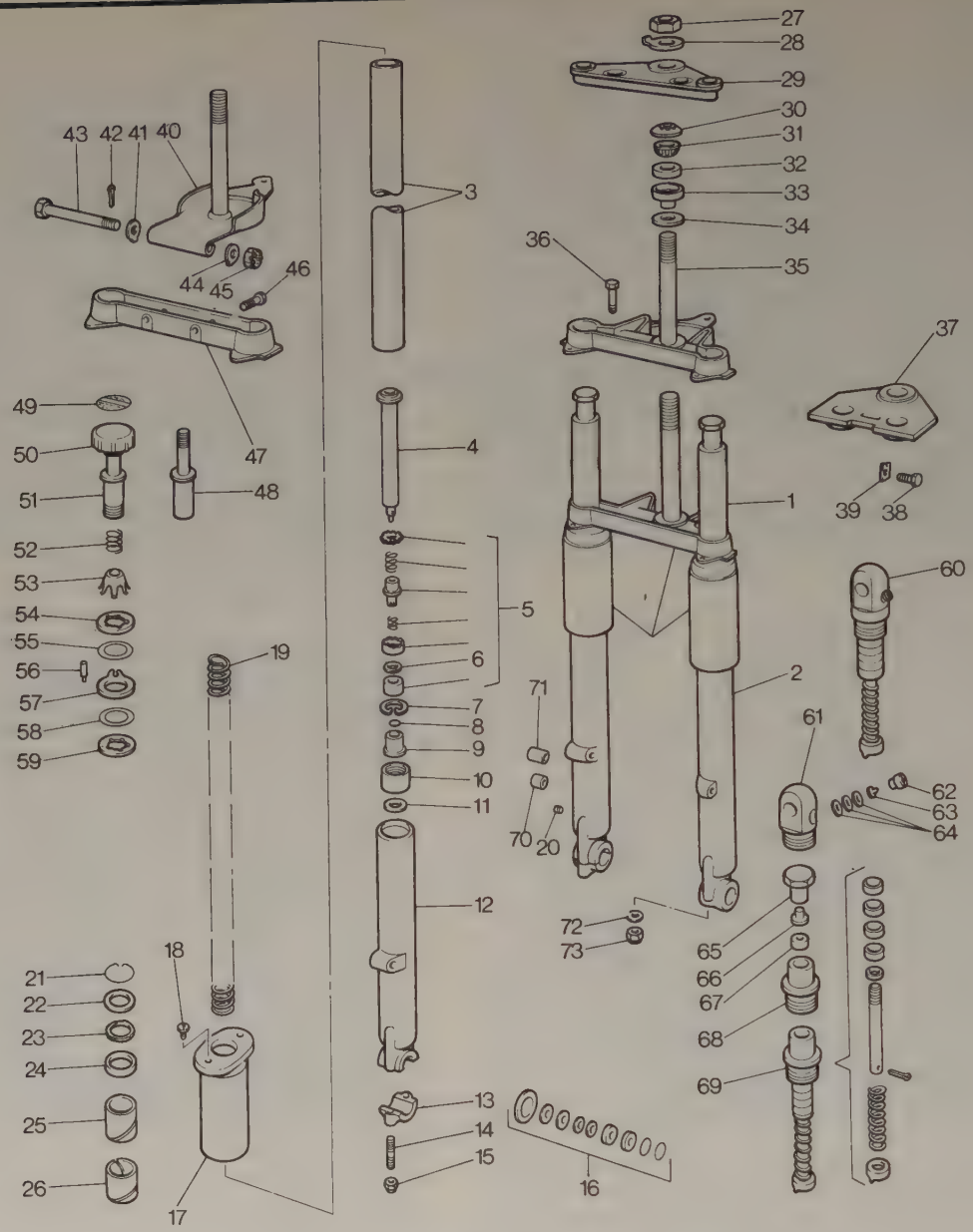



**Fig. 6.1. Hydra Glide front fork - FL and FLH models**

1 *Front forks - complete - non adjustable*
2 *LH fork leg - complete*
3 *Stanchion - 2 off*
4 *Damper rod - 2 off*
5 *Damper component set - 2 off*
6 *Shim - ar*
7 *Circlip - 2 off*
8 *Sealing washer - 2 off*
9 *Damper rod seat - 2 off*
10 *Tapered bush - 2 off*
11 *Sealing washer - 2 off*
12 *RH fork lower leg*
13 *Spindle cap*
14 *Stud - 2 off*
15 *Nut - 2 off*
16 *Oil seal set - complete*
17 *Shroud - 2 off*
18 *Screw - 4 off*
19 *Fork spring - 2 off*
20 *Drain plug - 2 off*
21 *Circlip - 2 off*
22 *Backing washer - 2 off*
23 *Felt seal - 2 off*
24 *Oil seal - 2 off*
25 *Upper bush - 2 off*
26 *Lower bush - 2 off*
27 *Crown nut*
28 *Tab washer*
29 *Upper yoke*
30 *Adjuster nut*
31 *Tapered inner race - 2 off*
32 *Outer race - 2 off*
33 *Bearing housing - 2 off*
34 *Washer*
35 *Lower yoke/steering stem*
36 *Bolt - 2 off*
37 *Upper yoke - adjustable fork*
38 *Bolt - 2 off*
39 *Washer - 2 off*
40 *Lower yoke bracket/ steering stem*
41 *Special tab washer - 2 off*
42 *Split pin*
43 *Bolt*
44 *Special tab washer*
45 *Castellated nut*
46 *Pinch bolt - 2 off*
47 *Lower yoke*
48 *Damper adjuster screw*
49 *Trim*
50 *Damper knob*
51 *Adjuster screw*
52 *Coil spring*
53 *Diaphragm spring*
54 *Friction plate*
55 *Friction washer*
56 *Anchor pin*
57 *Anchor plate*
58 *Friction washer*
59 *Lower friction plate*
60 *Top bolt/breather - adjustable fork - 2 off*
61 *Top bolt - 2 off*
62 *Oil filler plug - adjustable fork - 2 off*
63 *Top bolt - non adjustable fork - 2 off*
64 *Sealing washer*
65 *Top bolt - non adjustable fork - 2 off*
66 *Breather valve - 2 off*
67 *Oil seal - 2 off*
68 *Breather body - 2 off*
69 *Breather complete - 2 off*
70 *Caliper upper bush - 2 off*
71 *Caliper lower bush - 2 off*
72 *Plain washer - 2 off*
73 *Nut - 2 off*

*Electra Glide models only - Hydra Glide front fork*

7 Detach the handlebar fairing from the front forks. The method of retention will depend on the type of unit fitted. Unscrew the single screw holding the headlamp/reflector unit in place. The screw passes through the bottom of the chrome rim. Pull the assembly away and disconnect the wiring to the unit by pulling the socket off the rear of the reflector. Disconnect the wires running from the spotlamps at the connecting board. Carefully note the wiring by making a sketch. **This is important; rewiring can be difficult unless the positions are noted.** Remove the bolts securing the spotlamp bracket and lift the complete assembly away.

8 Unscrew the thin nuts holding each of the spotlamp switches to the rear of the right-hand headlamp shell casting. Push the switches through and temporarily replace the rings. The two halves of the headlamp shell casting are retained by two screws each passing into the relevant side of the yokes, and by a single screw at the top which passes through both halves. Remove the screws and detach the shell halves.

9 Disconnect the wiring leads to the horn and then detach the main wiring junction board from the upper steering yoke. Remove the horn complete with the bracket.

10 Disconnect the control cables and electrical leads from the handlebar controls, or remove the controls complete with the cables and leads. If the latter method is adopted, separate the wiring leads at the junction board, **carefully noting the wiring positions.**

11 Carefully thread all the wiring back away from the front forks, making disconnections where necessary **and always noting the positions of wires to aid replacement.** Remove the handlebars complete with the mounting bracket, which is secured from below the upper yoke by two bolts. The handlebar bracket is covered by an aluminium casing, which is retained by two self-tapping screws.

12 Remove the top bolt and 'O' ring from each fork leg (non-adjustable fork only) and then slacken the two bolts which pass through the bottom yoke, clamping the fork stanchions (upper tubes) in place. The fork legs can now be pulled downwards individually, out of the yokes and removed from the machine.

13 On machines fitted with the adjustable forks the steering damper must now be removed. Unscrew the damper knob and lift out the coil spring, spring cover and the diaphragm spring. Prise out the pressure disc with a screwdriver and remove the anchor plate and friction washer. The final pressure plate can then be prised from place.

14 Knock down the tab washer (where fitted) and loosen and remove the crown nut. On models with a steering damper, the nut requires the use of a 'C' spanner for removal. If this is not available, a soft brass punch may be used. The upper yoke can now be lifted off the steering stem. If necessary it may be freed using a rawhide mallet.

15 Support the weight of the lower yoke and steering stem and unscrew the steering head bearing adjuster nut. The nut is of a special type, and ideally, should be unscrewed using a peg spanner. A brass punch, however, may be used as a substitute. After removal of the nut, the lower yoke may be removed complete with the bottom tapered bearing inner race, leaving the complete upper bearing and the lower bearing inner race in the steering head lug.

16 The polished fork shrouds are retained on the lower yoke by two screws each. These items only require removal if they or the yoke are damaged.

*Super Glide models only*

Disconnect the control cables and electrical leads from the handlebar controls, or remove the control cables and electrical leads with their respective controls still attached. The shape of the handlebars and the length of the cables will probably dictate the best approach. It is best to disconnect the battery during this operation. Care is needed with the hydraulic disc brake master cylinder, which must be kept level to prevent air from entering the system.

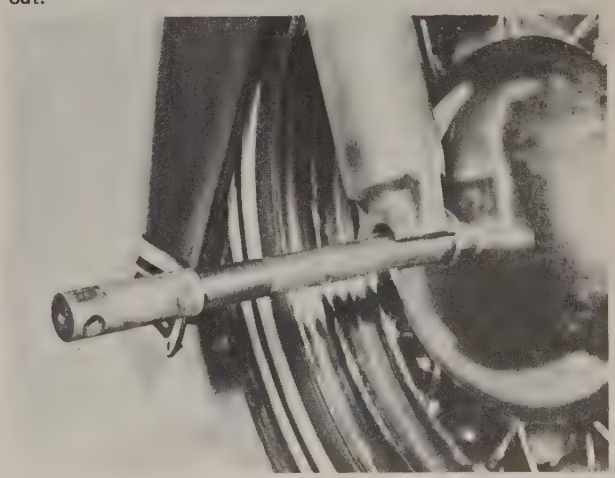
Remove the finned clamp that retains the handlebars. It is retained by four socket head screws. The handlebars can now be lifted away. Unscrew the drive cables from the speedometer and tachometer heads, then remove the instrument heads, complete with their mountings, by unscrewing the bolt that retains each mounting to the top of each fork leg. Disconnect the electrical leads and place the instrument heads in a safe place until reassembly commences.

Remove the two bolts that secure the small cowl and warning lamp console to the upper fork yoke. The cowl and headlamp mounted below can be suspended without need to remove the electrical connections, if preferred.

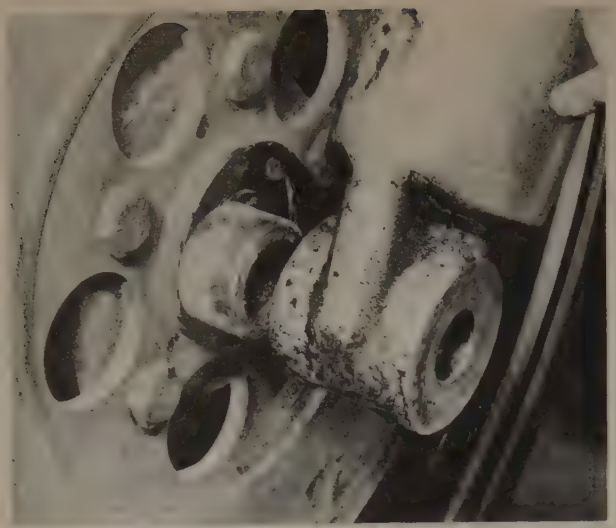
Unscrew the hexagon bolts from the top of each fork leg, but do not remove them completely at this stage. Loosen the bolts in the upper and lower yokes which clamp the fork stanchions (upper tubes) in place. The fork legs are now free to be moved downward out of the yokes and away from the machine.

The upper ends of the individual fork legs are tapered and mate with a matching taper within the upper fork yoke. Give the loosened hexagon bolts in the top of each fork leg a sharp tap with a rawhide mallet to break this taper, then remove the hexagon bolts completely. Do not use excess force, or the internal threads will be damaged. Support the weight of the lower yoke. Slacken the pinch bolt through the rear of the upper fork yoke and remove the sleeve nut from the top of the steering head column. After removal of the nut, the lower yoke may be lifted from position, together with the lower tapered bearing inner race. The outer race will remain in the steering head lug as will the complete upper tapered roller bearing and dust cover. The dust cover and inner bearing race may be lifted out.

2.3a Slacken clamp bolts before ...

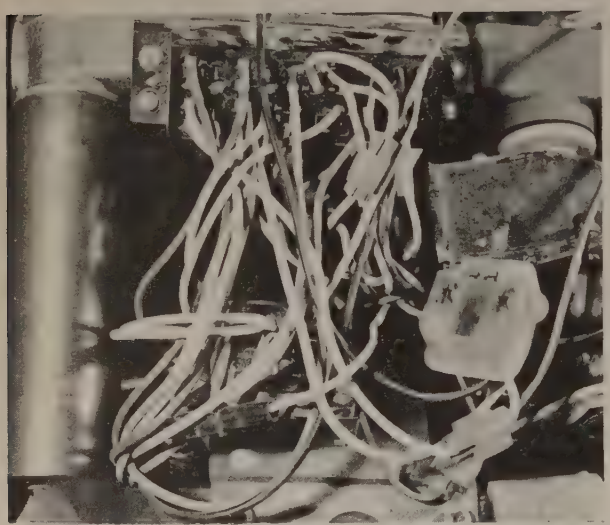


2.3b ... withdrawing the wheel spindle

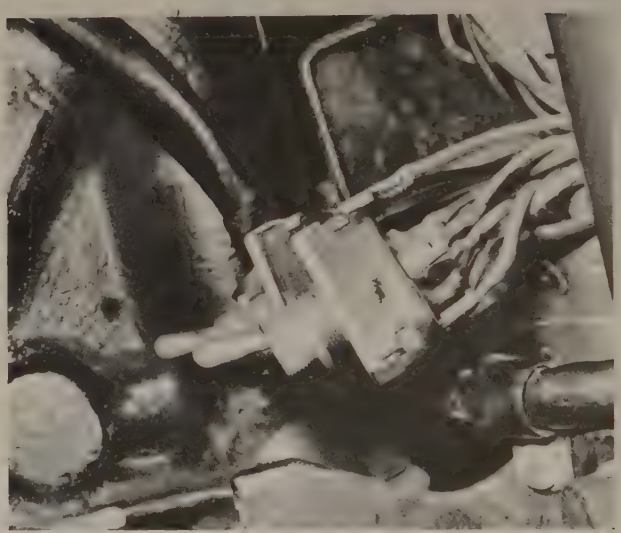


2.3c Note the wheel spacer on left-hand side

2.7a Mudguard is held by two bolts on each leg

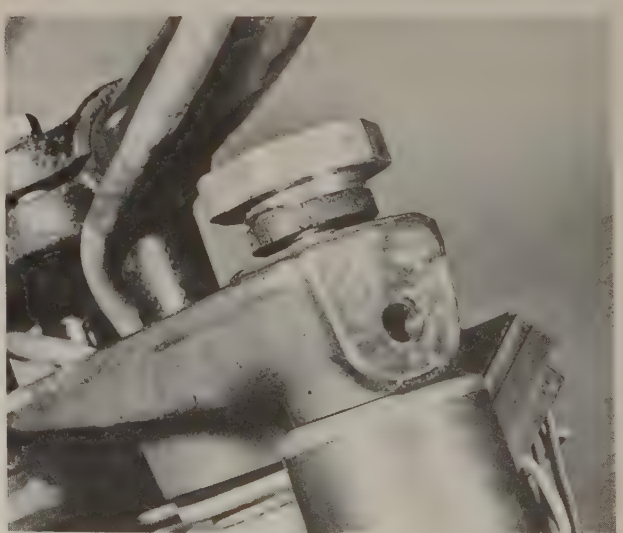


2.7b Note wiring. Take care when removing from numbered board

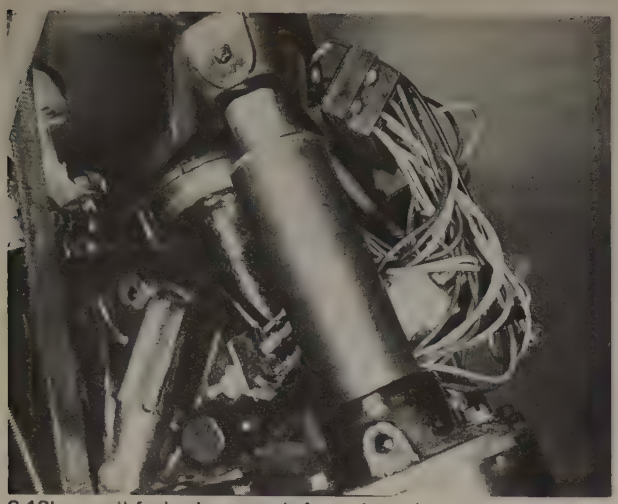


2.8 Spotlamp switches are held by thin nuts

2.11 Handlebar bracket is secured by two nuts



2.12a Unscrew fork top caps and ...



2.12b ... pull forks downwards from the yokes

## 3 Front forks: dismantling the individual fork legs

1 Before the fork legs are dismantled, the damping oil should be drained. Each leg is fitted with a small drain plug or screw just above the wheel spindle housing. Before removing the drain plug, unscrew the stanchion top bolt, if not already removed, to allow the oil to drain more easily. The legs may be pumped to aid drainage.
2 It is advisable to dismantle each fork leg separately, using an identical procedure. There is less chance of unwittingly exchanging parts if this approach is adopted. Commence by inverting the fork leg so that the internal fork spring is displaced, also the fork spring guide on pre-1976 FX models.
3 Invert the fork leg assembly and clamp the lower fork leg in a vice, well protected by having part of an old inner tube wrapped around it. Clamp it only lightly - enough to prevent it from rotating whilst the socket screw is removed from the recess within the wheel spindle cut-out. Hydra Glide forks are fitted with a nut in place of the socket screw. If the nut or socket screw will not undo, due to the damper rod rotating, attempt to lock the rod by replacing and applying pressure to the fork spring. On all but late Super Glide models, the upper end of each damper rod has a slotted or milled head. If rotation cannot be prevented by compressing the fork spring, a length of steel rod with a suitably shaped end, or a long shanked screwdriver may be used to hold the rod stationary. Invert the assembly again and draw off the dust cover through which the fork stanchion passes (where utilised) and remove the circlip, felt seal and washer (Hydra Glide forks only). This will permit the stanchion to be pulled from the lower fork leg, with the damper unit inside.
4 To detach the damper unit, remove the internal circlip at the lower end of the fork stanchion. The damper unit is then free to be drawn out. It is a built-up assembly which can be further dismantled if it malfunctions and parts require renewal.
5 Three different types of damper unit have been employed, as shown in the accompanying illustrations. The piston(s) are the parts most likely to suffer wear, after an extended period of service. Wear will be greatly accelerated if the forks are run with a low oil content or with oil that has become contaminated.
6 There is an oil seal within the upper portion of each lower fork leg. If the retaining circlip is removed, the oil seal can be prised from position. Do not disturb it unless it has to be renewed or if access is required to the two inner bushes, which will have to be renewed when play in the fork legs develops.

## 4 Front forks: examination and renovation

1 The parts most likely to wear over an extended period of service are the fork bushes, within the lower fork legs and the oil seals. Worn fork bushes cause judder when the front brake is applied and the increased amount of play can be detected by pulling and pushing on the handlebars when the front brake is applied hard.
2 It is a skilled job to renew the fork bushes, particularly as the new bushes have to be reamed to size, after they have been inserted. This type of repair is best entrusted to a Harley-Davidson specialist, or alternatively replacement lower fork legs purchased, when the amount of wear becomes pronounced.
3 The oil seals can be prised out of position when the retaining circlip has been removed. New oil seals should be inserted with great care and located correctly, before the retaining circlip is replaced. Special care is necessary when the fork stanchion is being reinserted during reassembly of the forks, as the feather-edge seal is easily damaged. It is best to coat the seal lips with grease first.
4 If the fork damping loses its effectiveness, the damper pistons of the damper assembly should be renewed. These are the parts most likely to wear.
5 Before reassembling the forks, check the sliding surface of the fork stanchions. If they are scuffed, scored or badly worn, the stanchions should be renewed, in conjunction with the fork bushes.
6 It is not advisable to straighten forks that have been bent in an accident, even if a specialist repair service is available. There is no means of knowing whether the parts concerned have been overstressed and will be subject to sudden fatigue failure. The stanchions should always be checked for straightness by rolling them on a flat surface.
7 The fork yokes are also liable to become twisted or distorted in an accident. As in the case of the fork stanchions, they should be renewed and not repaired, especially as they will prove far more difficult to align correctly.
8 Do not neglect to change the fork oil at the recommended service interval. If the oil becomes contaminated with water, as is likely to occur as the result of condensation, an emulsion will be formed which will greatly accelerate the rate of wear of the moving parts.

3.1 Damping oil drain plug

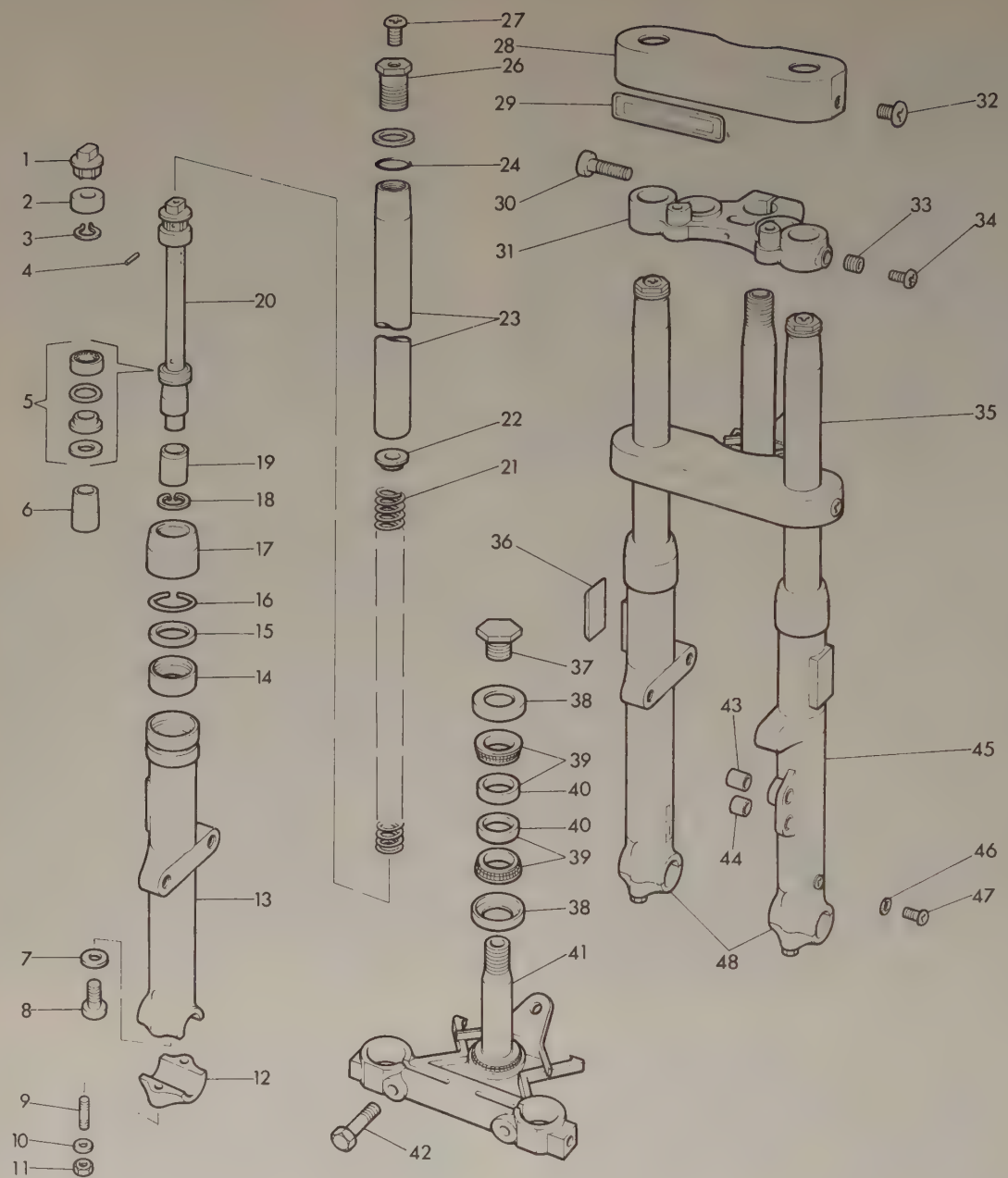
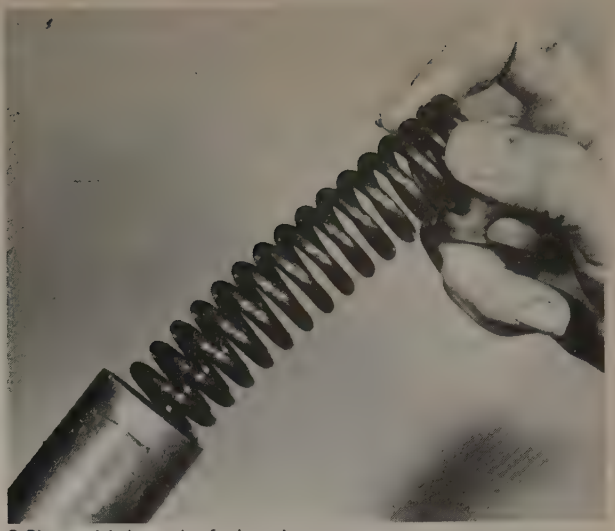


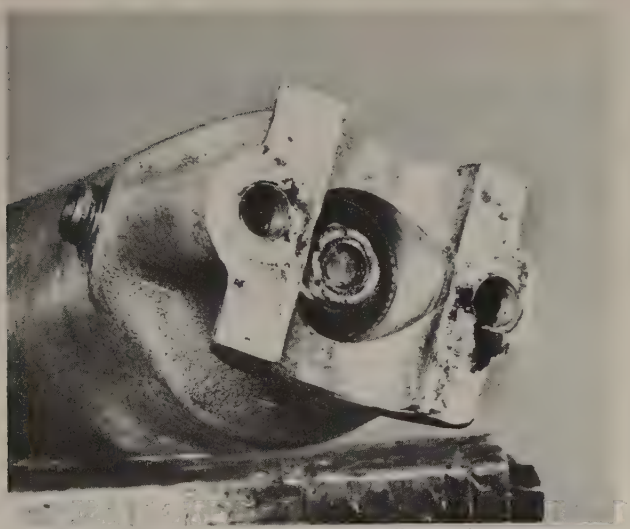

**Fig. 6.2. Front fork assembly - FX models 1973 - 75**

1 *Upper piston seat - 2 off*
2 *Upper damper piston - 2 off*
3 *Circlip - 2 off*
4 *Roll pin - 2 off*
5 *Damper valve assembly - 2 off*
6 *Damper rod seat - 2 off*
7 *Washer - 2 off*
8 *Socket screw - 2 off*
9 *Stud - 4 off*
10 *Plain washer - 4 off*
11 *Nut - 4 off*
12 *Spindle cap - 2 off*
13 *Fork RH lower leg*
14 *Oil seal - 2 off*
15 *Backing washer - 2 off*
16 *Circlip - 2 off*
17 *Dust excluder - 2 off*
18 *Circlip - 2 off*
19 *Lower piston - 2 off*
20 *Damper rod complete - 2 off*
21 *Fork spring - 2 off*
22 *Upper spring seat - 2 off*
23 *Stanchion - 2 off*
24 *'O' ring - 2 off*
26 *Plain washer - 2 off*
27 *Top bolt - 2 off*
28 *Oil filler plug - 2 off*
29 *Trim*
30 *Lower yoke shroud*
31 *Upper yoke*
32 *Screw - 2 off*
33 *Threaded insert - 2 off*
34 *Screw - 2 off*
35 *LH fork leg - complete*
36 *Reflector - 2 off*
37 *Crown bolt*
38 *Bearing housing - 2 off*
39 *Tapered roller bearing - 2 off*
40 *Outer bearing race - 2 off*
41 *Lower yoke/steering stem*
42 *Pinch bolt - 2 off*
43 *Caliper upper bush*
44 *Caliper lower bush*
45 *LH lower leg*
46 *Sealing washer - 2 off*
47 *Drain plug - 2 off*
48 *Spindle clamp - 2 off*

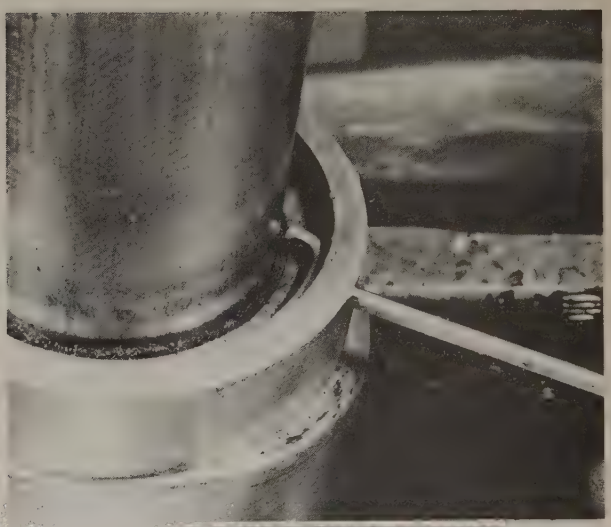
3.2a Unscrew the stanchion top bolt and ...



3.2b ... withdraw the fork spring

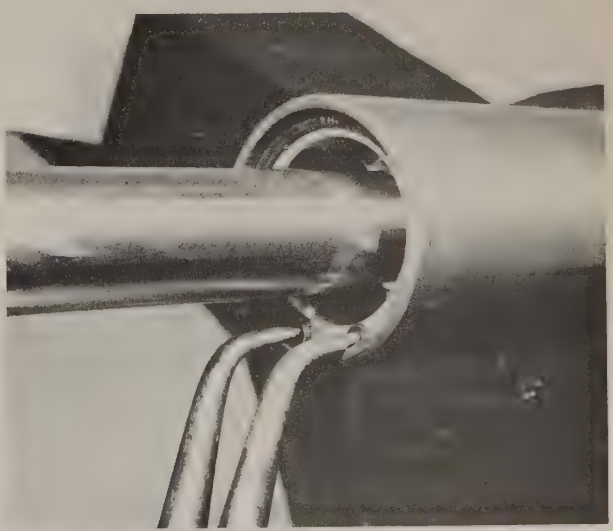


3.3a Remove the damper rod nut and sealing washer



3.3b Push out the circlip (Hydra Glide forks only) and ...

3.3c ... remove the serrated washer and felt seal



3.4a Remove the internal circlip to allow ...

3.4b ... the damper rod to be withdrawn

3.5 Damper rod assembly complete

3.6 Oil seal and upper slider bush

4.8 Clean breather valve thoroughly

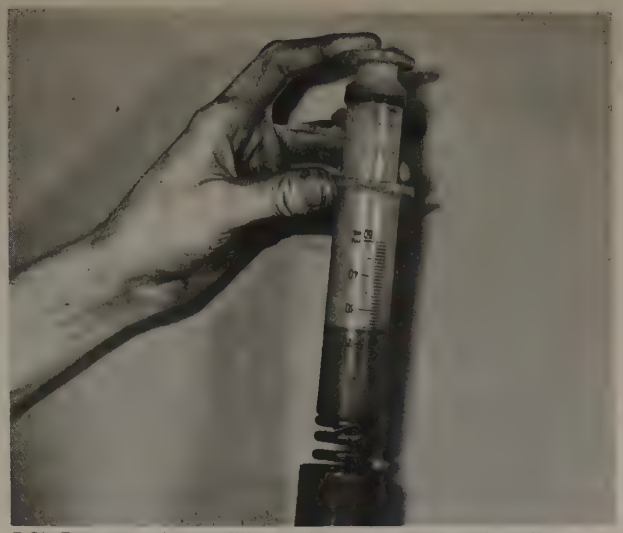
## 5 Front forks: replacement

1 Replace the front forks by reversing the dismantling procedures described in Sections 2 and 3 of this Chapter. On Super Glide models check that the speedometer drive gearbox is engaged correctly with the front wheel hub prior to replacement of the wheel and that air has not entered the hydraulic system, needing a bleeding operation to remove it. On drum brake models, make especially sure the brake plate torque bolt is replaced and tightened. If it works loose and drops out, the front brake will lock on, immediately it is applied. This will almost certainly cause a serious accident.

2 Before tightening the wheel spindle assembly, yoke pinch bolts and the bolts in the top of each fork leg, bounce the forks several times to make sure they resettle in their original locations and work quite freely. Complete the final tightening from the bottom upwards.

3 Do not omit to add the correct amount of damping oil to each fork leg, after checking the drain plugs are in position and tightened. Hydra Glide forks have a capacity of 7 oz (207 cc) per leg and Super Glide models 6 oz (178 cc). Use oil of the recommended grade and viscosity. This is important for correct suspension action.

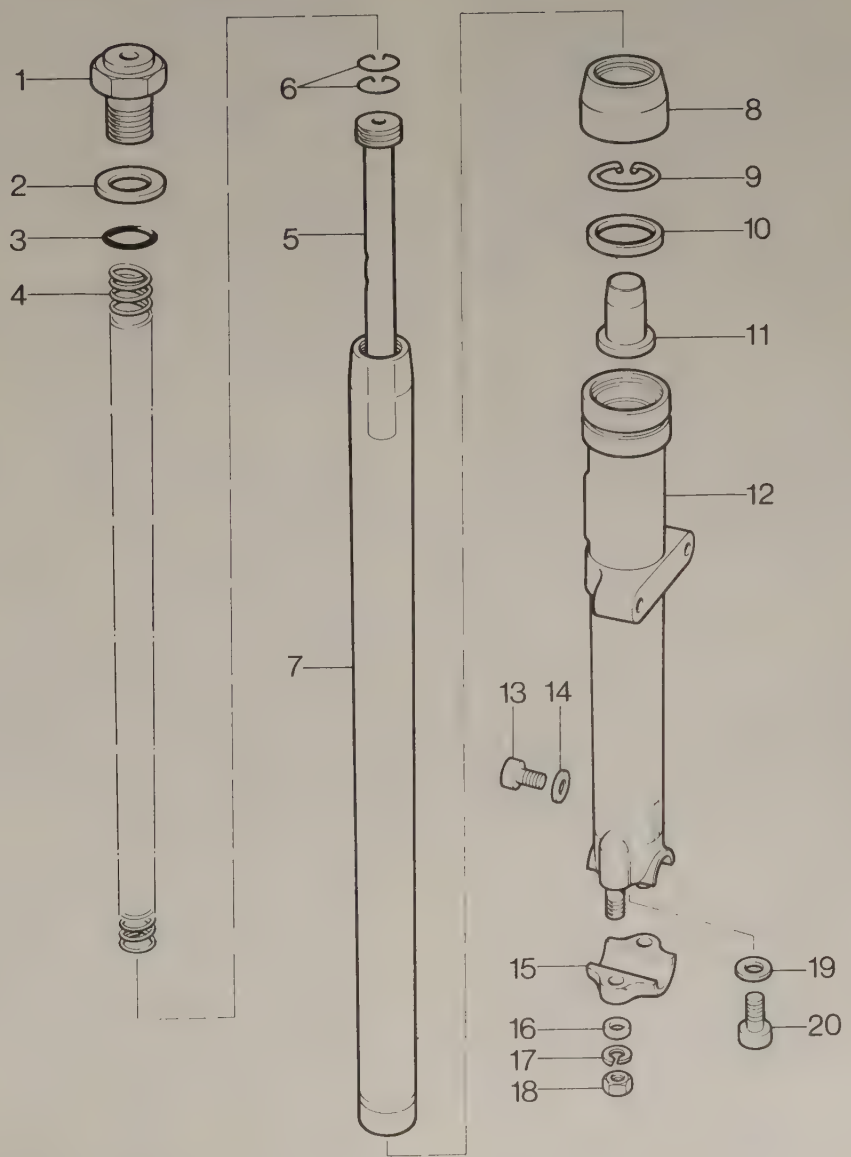
5.3a Check condition of top bolt sealing ring



5.3b Do not omit to refill each fork leg with damping oil

**Fig. 6.3. FX front fork legs - Showa type - 1976 on**

1 *Top bolt - 2 off*
2 *Plain washer - 2 off*
3 *'O' ring - 2 off*
4 *Fork spring - 2 off*
5 *Damper rod - 2 off*
6 *Piston ring - 2 off*
7 *Stanchion - 2 off*
8 *Dust excluder - 2 off*
9 *Circlip - 2 off*
10 *Oil seal - 2 off*
11 *Damper rod seat - 2 off*
12 *Fork lower leg - 2 off*
13 *Drain plug - 2 off*
14 *Sealing washer - 2 off*
15 *Spindle cap - 2 off*
16 *Plain washer - 4 off*
17 *Spring washer - 4 off*
18 *Nut - 4 off*
19 *Sealing washer - 2 off*
20 *Socket screw - 2 off*



### 6 Steering head bearings: examination and renovation

1 If the steering head bearings require attention, they are readily accessible when the front forks have been removed as a complete unit. Clean and examine the two tapered roller bearings. The inner and outer races and the rollers themselves should have a polished appearance, with no evidence of pitting or chipping.
2 If renewal is necessary, the outer race of each bearing should be renewed as a set with the inner race. It is also advisable to renew both bearings at the same time. The bearing outer races are a tight fit in the steering head and must be drifted from position. The lower bearing inner race may be prised from position, using two tyre levers.
3 On Electra Glide models, the outer races are a press fit in steel cups which are in turn a press fit in the steering head lug. To remove the race from each cup two small holes must be drilled in the rear of each cup through which a small punch may be inserted. In this way the old races may be drifted out.
4 When refitting the bearings, pack each one with an all purpose grease. No facility is provided for further lubrication during service, so this must not be overlooked.
5 Adjustment of the steering head bearings is critical if good roadholding is to be preserved. They should be tightened sufficiently to eliminate all play but not overtightened. Note that it is possible to place a load of several tons on the bearings by over-tightening and yet still turn the handlebars. Adjustment is effected by turning the adjuster nut at the top of the steering head column, immediately above the upper fork yoke. When adjustment is correct, there should be no play in the bearing and when the front wheel is raised clear of the ground, a light tap on either handlebar end should cause the forks to swing to full lock.
6 Over-tight steering head bearings will cause the machine to roll at slow speeds, whilst slack bearings will cause fork judder when the front brake is applied.

### 7 Front forks: changing the damping oil

1 On Super Glide models the front fork oil should be changed at approximately 5000 miles or yearly intervals. Regular oil changes are not required on the Hydra Glide front forks fitted to the Electra Glide models, unless contamination has occurred, or leakage has reduced the quantities.
2 Remove the top bolt from each fork leg. On adjustable forks the filler plugs only should be removed. Remove the drain plug from the base of each fork leg and allow all the oil to drain into a suitable container. Pump the forks up and down to aid drainage.
3 Replace the drain plugs, ensuring that the sealing washers are in good condition. Replenish each fork leg with 6.5 oz (193 cc) of fluid for Hydra Glide forks and 5 oz (148 cc) for Super Glide forks. Pump the forks up and down whilst refilling to accelerate the process. Refilling is simplified considerably, especially on adjustable forks if a header tank arrangement is used. The header tank holding the correct quantity of fluid should be suspended well above the machine and interconnected with the filler orifice on the fork leg in question, using a suitable length of transparent tubing.

### 8 Adjustable front forks: altering trail angle

1 On machines originally fitted with a sidecar or supplied for sidecar use, adjustable front forks are fitted which have provision for alteration of the trail angle to suit either solo or sidecar use.
2 To alter the trail angle from solo to sidecar use, remove the nut from the adjustment bracket bolt. A split pin secures the nut. Tap the bolt out sufficiently so that the special tanged washer can be prised away from the bracket. Grasp the fork legs and pull them forwards sharply. Rotate both tanged washers so that the tangs or pins face forwards and locate in the holes in the bracket. Fit the nut and tighten it fully. **DO NOT** omit the split pin. Altering the forks for solo use is carried out by reversing the procedure, so that the tangs on the washer face rearwards.

### 9 Frame assembly: examination and renovation

1 If the machine is stripped for a complete overhaul, this affords a good opportunity to inspect the frame for cracks or other damage which may have occurred in service. Check the front down tube immediately below the steering head and the top tube immediately behind the steering head, the two points where fractures are most likely to occur. The straightness of the tubes concerned will show whether the machine has been involved in a previous accident.
2 If the frame is broken or bent, professional attention is required. Repairs should be entrusted to a competent repair specialist, who will have available all the necessary jigs and mandrels to preserve correct alignment. Repair work of this nature can prove expensive and it is always worthwhile checking whether a new replacement from the manufacturer will prove much more expensive. Remember that there is no easy means of checking whether an accident damaged frame has been overstressed and is liable to fatigue failure.
3 The part most likely to wear during service is the pivot assembly of the swinging arm rear fork. Wear can be detected by pulling and pushing the fork sideways, when any play will immediately be evident because it is greatly magnified at the fork end. Worn pivot bearings will give the machine imprecise handling qualities which will be most noticeable when traversing uneven surfaces.
4 Remember that a frame which is out of alignment will cause handling problems and may even promote 'speed wobbles'. If misalignment is suspected, as the result of an accident, it will be necessary to strip the machine completely so that the frame can be checked and if necessary, renewed.

### 10 Swinging arm rear fork: dismantling, examination and renovation

1 The rear fork of the frame assembly pivots on two taper roller bearings, the inner races of which are a press fit in the swinging arm fork tubular crossmember. On initial assembly the swinging arm fork pivot shaft is tightened to pre-load the tapered-roller bearings. Evidence of play in the bearings may be due to slight wear in the bearings nullifying the pre-load effect, and not advanced wear, which will require renewal of the bearings. In either case the swinging arm fork must be removed from the machine to ascertain the real cause of the play.
2 Commence operations by steadying the machine with packing under the engine unit, so that the rear wheel is well clear of the ground. It must be standing firmly, on level ground. On Electra Glide models, the panniers must be detached to gain access to the rear portion of the machine.
3 Separate the final drive chain by detaching the spring link. This task is made easy if the chain and link is positioned in the teeth of the rear wheel sprocket. Place a sheet of clean paper under the chain so that it does not fall on to the dirty floor, after separation. Disengage it from the rear wheel sprocket.
4 Remove the four bolts which clamp the brake caliper halves together. Separate the caliper components and remove them from the bracket. The outer half of the caliper may be suspended from the brake hose to which it is attached.
5 On Electra Glide models, the rear bumper bar, the centre section of pannier rails and the mudguard must be moved to allow removal of the rear wheel. Remove the bumper bar right-hand bracket bolt and loosen the bolt and nut on the left. Remove the bolts holding the centre sections of pannier rail,

and those bolts which secure the rear portion of mudguard. Hinge the bumper bar out towards the left and swing the rear section of the mudguard upwards. The mudguard may be held in the raised position, using a length of string or cable.

6 Unscrew the rear wheel spindle nut and remove it, together with the washer. Support the weight of the wheel and drift out the spindle. Lower the wheel from between the forks, noting the wheel spacer on the sprocket side, and withdraw it clear of the machine.

7 Disconnect the suspension units at the mounting points on the swinging arm fork. They are held in position by a bolt and nut passing through the lower eye.

8 Removal of the chainguard and also the brake caliper bracket and torque arm from the swinging arm fork is not strictly necessary as they do not impede fork removal. They may be detached as a matter of choice, to prevent damage to the finish.

9 Bend down the tab washer, which secures the swinging arm fork pivot shaft. Unscrew and withdraw the shaft, then withdraw the complete fork from between the frame lugs, towards the rear of the machine.

10 With the swinging arm fork on the workbench, pull the oil seal collars from each end of the cross-member. The bearing inner races are obscured beneath the oil seals. The inner races may be drifted from place, driving the oil seals out by passing a suitable drift through the cross-member from the opposite side. Removal of the outer races may be accomplished in the same operation, or as a separate operation, after the condition of the bearings has been ascertained.

11 Clean and examine the taper roller bearings for signs of wear or other deterioration which should be self-evident. If there is any doubt about the suitability of the bearings for further service, renew them both as a precaution. Most bearings fail as the result of pitting which occurs on the inner or outer races.

12 Renewal of the oil seals, as a matter of course, is also recommended, if they have been disturbed.

13 Reassemble and refit the swinging arm fork in the reverse order given for dismantling. Ensure that the bearings are liberally packed with grease and are absolutely clean. Even a small amount of grit in a bearing will accelerate wear.

14 After the pivot bolt has been refitted, it is necessary to place a small amount of tension on the taper roller bearings. This is achieved by attaching a spring balance to the extreme end of one of the swinging arm fork legs, before the rear suspension units are refitted. Take the reading (in pounds) necessary to make the fork turn on the pivot. The pivot bolt must be screwed up only slightly so that the fork may turn freely at this juncture. Now tighten the pivot until the drag is increased by about two pounds, as measured on the spring balance. When the reading is correct, the pre-load on the bearings is as specified. Tap the tab washer up against the hexagonal pivot bolt head to prevent rotation.

15 Replace the wheel and brake caliper components, also the rear mudguard, bumper bar and pannier rail (Electra Glide models). Refit the final drive chain, making sure the closed end of the spring link faces the direction of travel of the chain. It should not require adjustment if the chain adjusters have been left undisturbed, although it is always advisable to check.

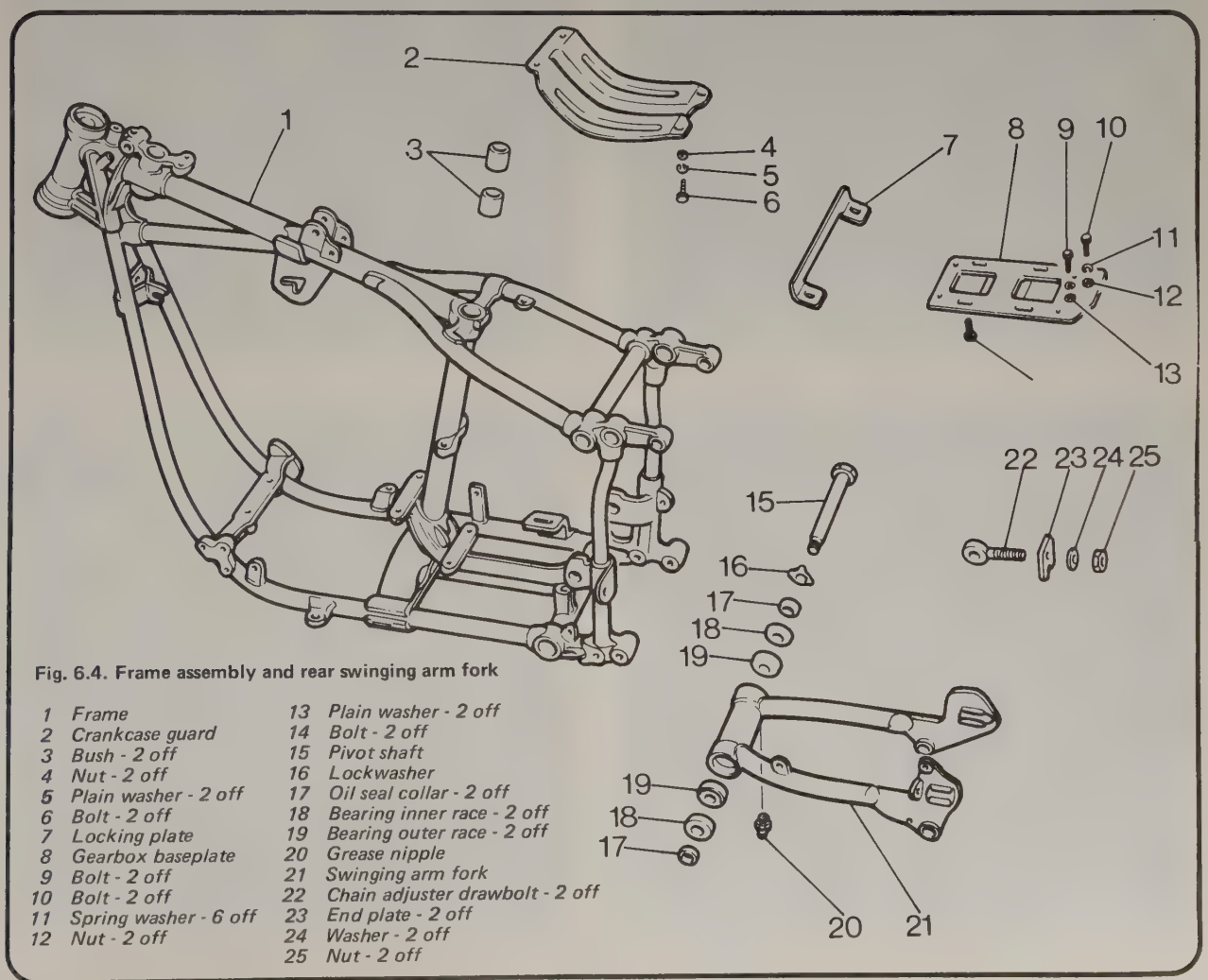
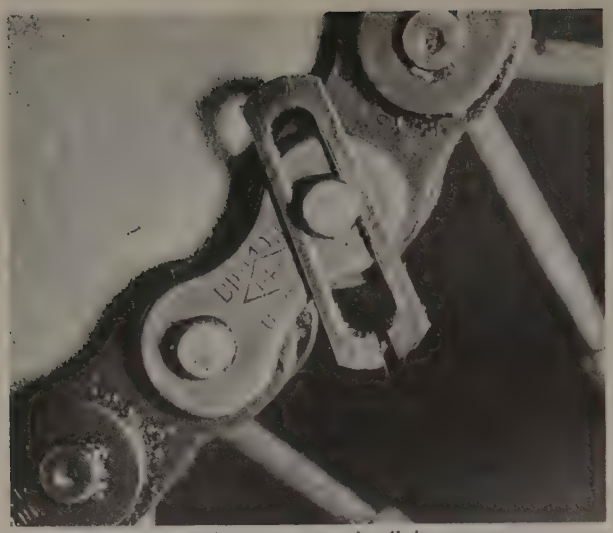
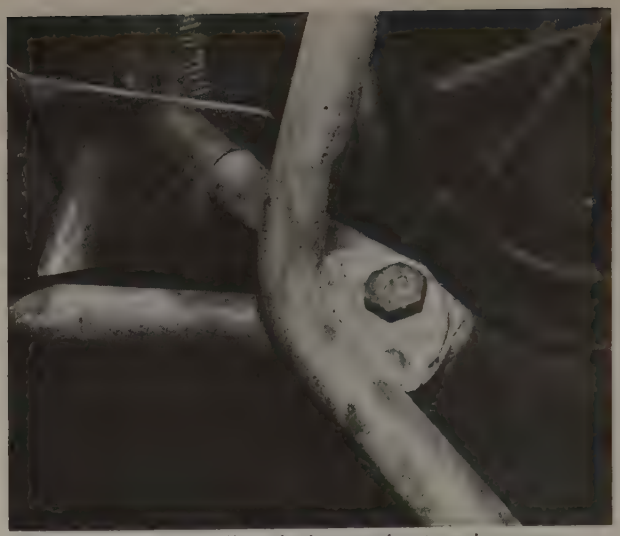



**Fig. 6.4. Frame assembly and rear swinging arm fork**

1 *Frame*
2 *Crankcase guard*
3 *Bush - 2 off*
4 *Nut - 2 off*
5 *Plain washer - 2 off*
6 *Bolt - 2 off*
7 *Locking plate*
8 *Gearbox baseplate*
9 *Bolt - 2 off*
10 *Bolt - 2 off*
11 *Spring washer - 6 off*
12 *Nut - 2 off*
13 *Plain washer - 2 off*
14 *Bolt - 2 off*
15 *Pivot shaft*
16 *Lockwasher*
17 *Oil seal collar - 2 off*
18 *Bearing inner race - 2 off*
19 *Bearing outer race - 2 off*
20 *Grease nipple*
21 *Swinging arm fork*
22 *Chain adjuster drawbolt - 2 off*
23 *End plate - 2 off*
24 *Washer - 2 off*
25 *Nut - 2 off*

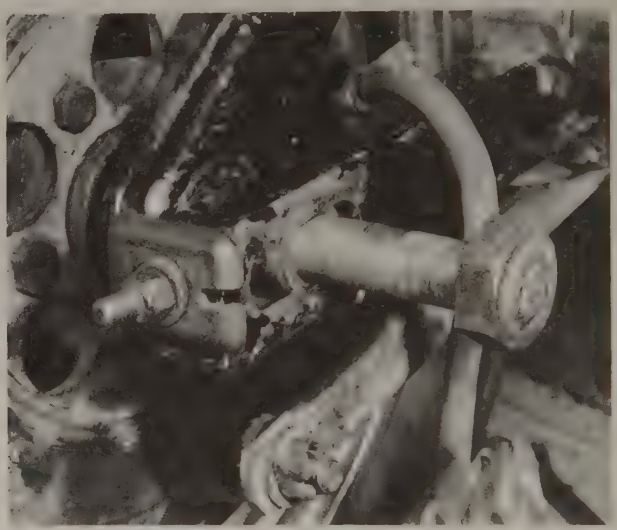


10.3 Separate rear chain at master spring link

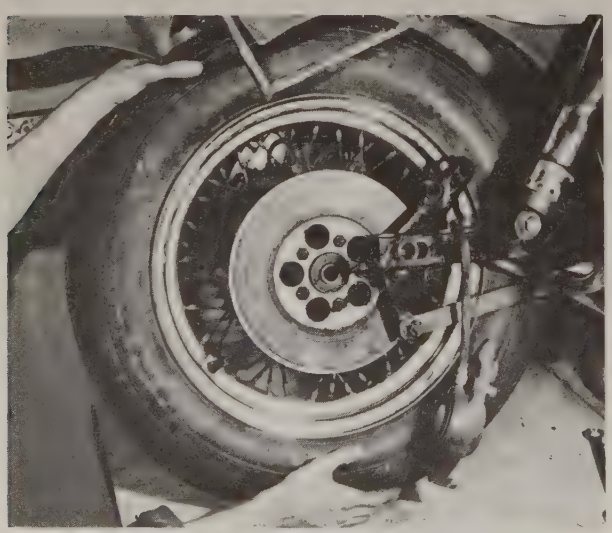


10.5a Remove bolt to allow the bumper bar to swing away

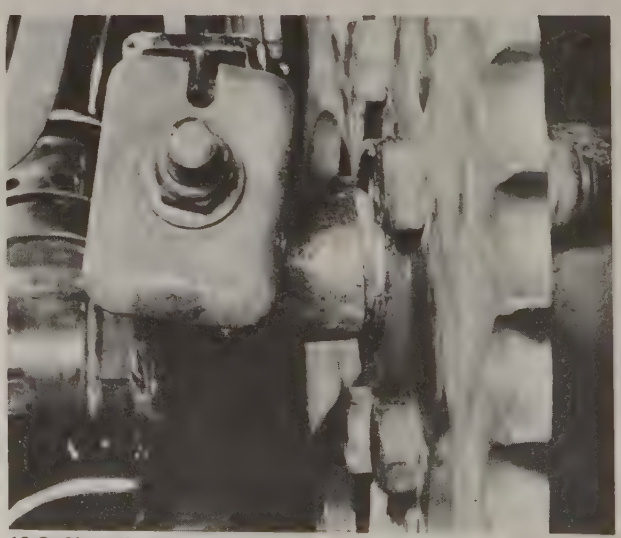
10.5b Remove the centre section of rails



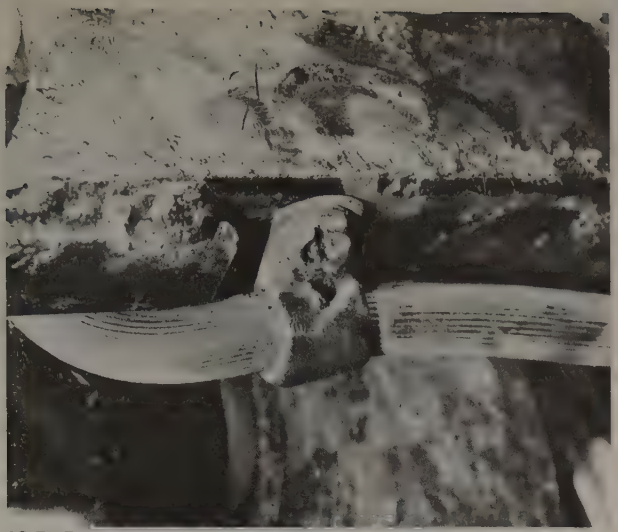
10.6a Withdraw the wheel spindle and ...



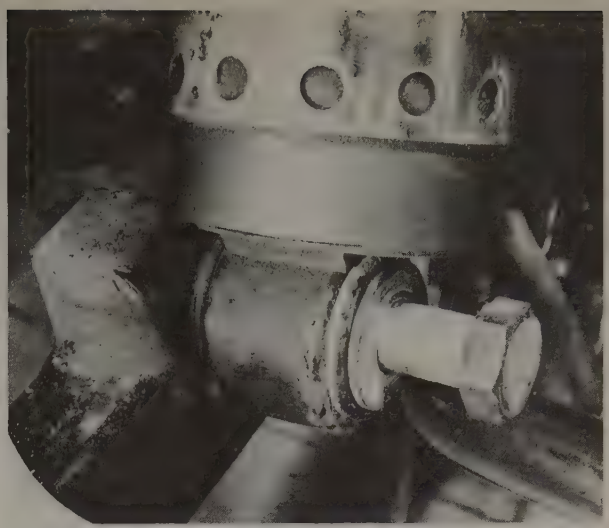
10.6b ... hinge mudguard upwards to allow wheel removal



10.6c Note the wheel spacer on sprocket side

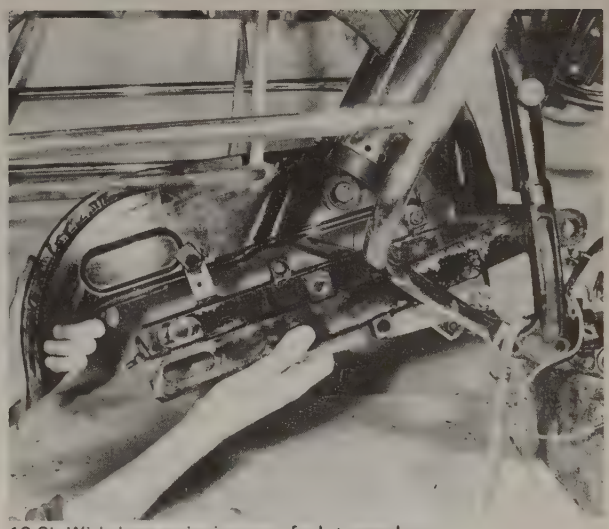


10.7a Detach clip to free hydraulic hose from fork



10.7b Remove lower suspension unit bolts

10.9a Unscrew pivot bolt after bending down tab washer



10.9b Withdraw swinging arm fork towards rear

10.13a Grease bearings thoroughly before replacing ...

10.13b ... the bearing cages followed by ...

10.13c ... the oil seal and ...

10.13d ... the oil seal collar

## 11 Rear suspension units: examination and renovation

1 The rear suspension units are of the compression spring type, with their movement controlled by an hydraulic damper unit that forms an integral part of the main assembly. Provision is made for varying the spring tension, so that the loading of the suspension units can be changed to suit the prevailing conditions.
2 The loading of the springs can be altered without need to remove either suspension unit from the machine. There is a series of holes around the lower end of each suspension unit, into which a special H-D peg spanner can be inserted. This will permit the suspension unit to be rotated so that the spring is either compressed more or relaxed more, depending on the direction of rotation. The suspension needs to be stiffened up if a pillion passenger or a heavy load is carried, if the machine is used off-road or over uneven terrain, or when the machine is used for high speed work. The setting will depend on personal choice. It is imperative that both suspension units are set to an identical loading, in the interests of good roadholding.
3 If it is necessary to change the springs for those of a different rating, or if the originals have compressed permanently, both units should be removed from the machine and clamped in turn in a vice, by the lower mounting point. Press downwards on the upper spring cover so that the spring is compressed and get an assistant to withdraw the split collets just below the upper mounting point. The cover and spring can now be drawn off, after releasing the pressure. Note the position and number of any washers that may also be displaced. This task is made easier if the unit is first set in the position of least spring tension.
4 When replacing springs of a different rating (or renewing springs) both must be identically matched, for reasons that are quite obvious. Suspension units should never be renewed singly.
5 If the damper unit proves faulty, resulting in either oil leakage or loss of damping action, it will have to be renewed as a complete unit, as the assembly is sealed and not repairable. To check the damping action, push and pull the damper rod. If satisfactory, resistance should be felt in either direction.
6 Because the damper units are sealed, there is no means of draining and refilling or topping up the rear suspension units.

## 12 Prop stand: examination

1 The 1200 cc models are not fitted with a centre stand and in consequence only a prop stand is fitted for parking when it is not in use. It is important to ensure the prop stand pivot is in good order and well lubricated, so that the stand will retract when the machine is raised to the normal riding position. This also applies to the return spring, which automatically retracts the stand when the weight is released from it.
2 It is important that the prop stand and pivot receive attention during regular periodic maintenance. If the stand should happen to drop into the extended position whilst the machine is being ridden, it will almost certainly foul some obstacle in the road and unseat the rider, possibly with serious consequences.

## 13 Footboards and footrests: examination and renovation

1 The rider's footrests are fitted by means of a pinch bolt and are of the folding type. In the event of accident damage, the folding portion can be detached from the main body by removing the pivot bolt that serves as the hinge.
2 Footrests should never be straightened whilst they are still attached to the frame. Whilst they can be straightened by the application of heat (after the footrest rubber has been removed) and bending in the desired direction, it is preferable to fit new components, especially if only the folding portion has suffered.
3 The rider's footboards fitted to Electra Glide models pivot upon shouldered bolts, thereby allowing each board to fold upwards if the machine falls over or is involved in an accident. The components most likely to become damaged when excessive weight is applied to a footboard are the two hinge brackets, which are retained by two rivets. The brackets can be straightened in situ, or if damaged beyond repair, removed after drilling out the rivets.

## 14 Rear brake pedal: examination and renovation

1 If the rear brake pedal is damaged, it can be bent straight again by the application of heat, whilst applying force in the desired direction. It must be removed from the machine first, after the return spring has been released.
2 If the brake pedal has a plated finish, this will almost certainly be destroyed in the area where heat is applied. For this reason, renewal may offer a more desirable alternative.

## 15 Dual seat: removal and replacement

1 On all Electra Glide models the traditional Buddy seat is fitted. The seat is supported on a seat post and is sprung by means of a coil spring passing into the frame rear downtube, which is located at the front by a cast bar pivoting on a bolt that passes through a frame lug between the two petrol tank

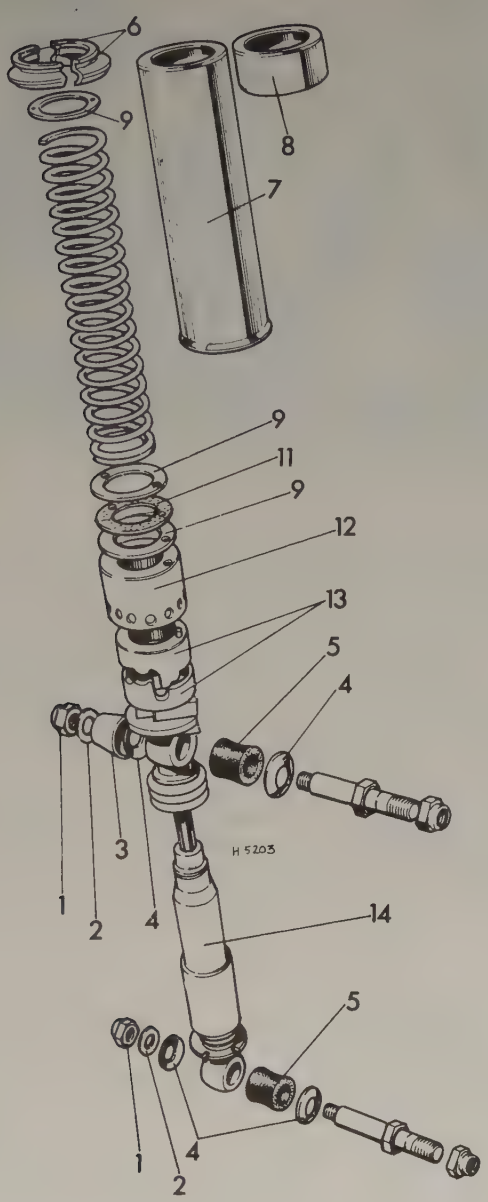



**Fig. 6.5. Rear suspension unit**

*1 Mounting stud nut - 2 off*
*2 Washer - 2 off*
*3 Stud cover*
*4 Cup washer - 4 off*
*5 Rubber bush - 2 off*
*6 Collet - 2 off*
*7 Shroud (long)*
*8 Shroud (short)*
*9 Washer - 3 off, low ground clearance*
*2 off, high ground clearance*
*10 Spring*
*11 Seal washer (low ground clearance)*
*12 Adjusting cup*
*13 Cam - 2 off*
*14 Damper unit*

halves. The seat is secured on the seat post by a clevis pin, which itself is secured by a spring clip. Late models (post 1975) utilise a modified Buddy seat where the rear of the seat is supported on a spring parallelogram structure mounted on the rear mudguard. The amount of spring tension in this suspension mechanism is adjustable.

2 The dual seat fitted to the Super Glide models is unsprung, being bolted directly to the rear mudguard.

## 16 Speedometer and tachometer heads: removal and replacement

### *Super Glide models only*

1 A speedometer and tachometer are fitted to all Super Glide models, excepting the 1973 model, where the former instrument only is utilised. The speedometer is driven by a cable from a gearbox mounted on the front wheel hub. The tachometer is an electronic component.

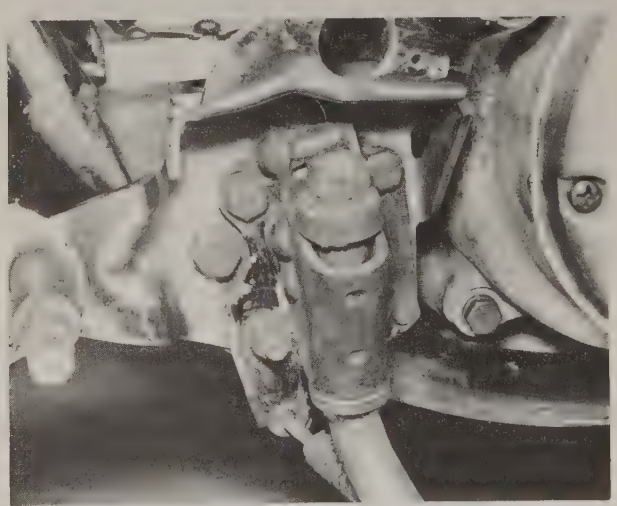
2 Before removal of the instruments can be accomplished, the speedometer drive cable must be detached. Unscrew the knurled ring from the underside of the instrument and pull the cable away. Where fitted, disconnect the main leads to the tachometer at the connectors.

3 The internal bulbs will pull away from the underside of each instrument head, complete with bulb holders. The bracket which holds the instrument head(s) is retained by two bolts passing into the upper fork yoke. Each instrument head is retained in the bracket by a nut or knurled thumb nut on each of the two mounting studs.

### *Electra Glide models only*

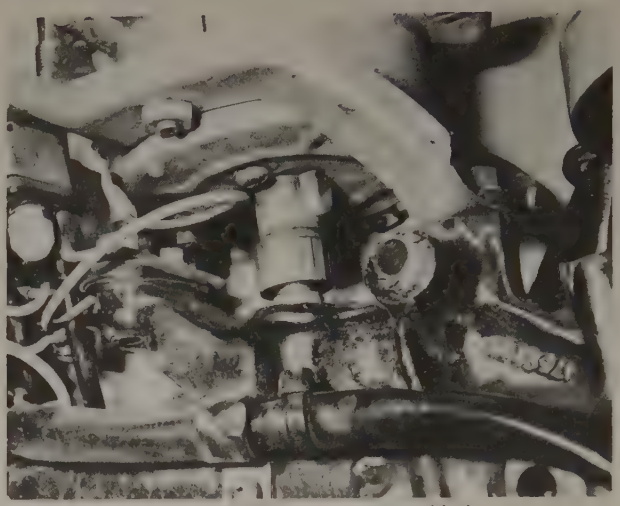
4 The speedometer is mounted within the main control console located on the fuel tank top. To gain access to the speedometer, remove the console cover, which is secured by a single central screw. Remove the two bolts and nuts which retain the speedometer to the mounting bracket and lift the instrument head up as far as possible. Detach the drive cable by unscrewing the knurled ring.

5 Apart from defects in either the drive or the drive cable, a speedometer or tachometer which malfunctions is difficult to repair. Fit a replacement or alternatively entrust the repair to a competent instrument repair specialist. Remember that a speedometer in correct working order is a statutory requirement in the UK. Apart from this legal necessity, reference to the odometer reading is the most satisfactory means of keeping pace with the maintenance schedules.



12.1 Check prop stand bracket bolts are tight

13.1 Footrests are retained by pinchbolts on splined shafts



16.4 Speedometer is retained by two nuts and bolts

### 17 Speedometer drive cable: examination and maintenance

1 It is advisable to detach the drive cable from time to time in order to check whether it is lubricated adequately, and whether the outer covering is damaged or compressed at any point along its run. Jerky or sluggish movements can often be traced to a damaged drive cable.
2 For greasing, withdraw the inner cable. After removing all the old grease, clean with a petrol-soaked rag and examine the cable for broken strands or other damage.
3 Regrease the cable with high melting point grease, taking care not to grease the last six inches at the point where the cable enters the instrument head. If this precaution is not observed, grease will work into the head and immobilise the instrument movement.
4 If the instrument head stops working, suspect a broken drive cable unless the odometer readings continue. Inspection will show whether the inner cable has broken; if so, the inner cable alone can be replaced and re-inserted in the outer casing, after greasing. Never fit a new inner cable alone if the outer covering is damaged or compressed at any point along its run.

### 18 Speedometer drive location and examination

1 On the Super Glide models, the speedometer drive gearbox is attached to the front wheel hub, which it engages by means of a projecting tongue and slot arrangement. The speedometer drive rarely gives trouble; it is pre-packed with grease and will require attention when the front wheel bearings have to be greased.
2 Electra Glide models have the drive taken from a shaft projecting from the forward wall of the gearbox, which is driven by a scroll gear integral with the layshaft double gear. The drive is provided by adequate lubrication from the gearbox and hence is unlikely to wear or fail.

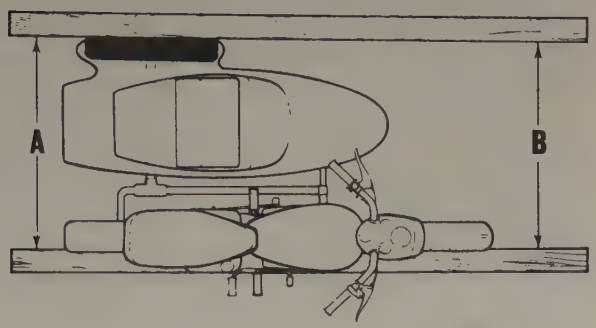
### 19 Sidecar alignment

1 Using conventional fittings, little difficulty is experienced when attaching a sidecar to a Harley-Davidson twin.
2 Good handling characteristics of the outfit will depend on the accuracy with which the sidecar is aligned. Provided the toe-in and lean-out are within prescribed limits, good handling characteristics should result, leaving scope for other minor adjustments about which opinions vary quite widely.
3 To check the toe-in, check that the front and rear wheels of the motorcycle are correctly in line and adjust the sidecar fittings so that the sidecar wheel is approximately parallel to a line drawn between the front and rear wheels of the machine. Re-adjust the fittings so that the sidecar wheel has a slight toe-in towards the front wheel of the motorcycle, as shown in Fig. 6.6. When the amount of toe-in is correct, the distance 'B' should be from 3/8 to 3/4 in less than the distance at 'A'.
4 Lean-out is checked by attaching a plumb line to the handlebars and measuring the distance between 'C' and 'D' as shown in Fig. 6.6. Lean-out is correct when the distance 'C' is approximately 1 inch greater than at 'D'.
5 Aligning a sidecar correctly is a task for the specialist. It is always advisable to seek the advice of a sidecar specialist as these notes are provided in very general terms, to act as a guide only.

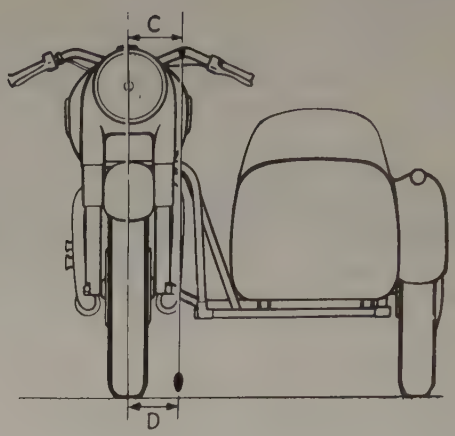
### 20 Cleaning the machine

1 After removing all surface dirt with a rag or sponge which is washed frequently in clean water, the machine should be allowed to dry thoroughly. Application of car polish or wax to the cycle parts will give a good finish, particularly if the machine receives this attention at regular intervals.
2 The plated parts should require only a wipe with a damp rag, but if they are badly corroded, as may occur during the winter when the roads are salted, it is permissible to use one of the proprietary chrome cleaners. These often have an oily base which will help to prevent corrosion from recurring.
3 If the engine parts are particularly oily, use a cleaning compound such as Gunk or Jizer. Apply the compound whilst the parts are dry and work it in with a brush so that it has an opportunity to penetrate and soak into the film of oil and grease. Finish off by washing down liberally, taking care that water does not enter the carburettor, air cleaner or the electrics. If desired, the now clean aluminium alloy parts can be enhanced still further when they are dry by using a special polish such as Solvol Autosol. This will restore the full lustre.
4 If possible, the machine should be wiped down immediately after it has been used in the wet, so that it is not garaged under damp conditions that will promote rusting. Make sure the chain is wiped and re-oiled, to prevent water from entering the rollers and causing harshness with an accompanying rapid rate of wear. Remember there is less chance of water entering the control cables and causing stiffness if they are lubricated regularly as described in the Routine Maintenance Section.

Fig. 6.6.




Aligning the sidecar wheel to the correct amount of toe-in




Setting the amount of 'lean out' by using a plumb line

**21 Fault diagnosis: frame and forks**

| Symptom | Cause | Remedy |
|---|---|---|
| Machine is unduly sensitive to road surface irregularities | Fork and/or rear suspension units damping ineffective | Check oil level in forks. Renew suspension units. |
| Machine rolls at low speeds | Steering head bearings overtight or damaged | Slacken bearing adjustment. If no improvement, dismantle and examine head races. |
| Machine tends to wander, steering imprecise | Worn swinging arm suspension bearings | Check and if necessary renew bearings. |
| Fork action stiff | Fork legs twisted in yokes or bent | Slacken off wheel spindle clamps, yoke pinch bolts and fork top nuts. Pump forks several times before retightening from bottom. Straighten or renew bent forks. |
| Forks judder when front brake is applied | Worn fork bushes<br>Steering head bearings slack | Strip forks and renew bushes.<br>Re-adjust to take up play. |
| Wheels seem out of alignment | Frame distorted through accident damage | Check frame after stripping out. If bent, specialist repair or renewal is necessary. |
| Machine handles badly under all types of condition | General frame and fork distortion as result of a previous accident or broken frame tube | Strip frame and check for alignment very carefully. If wheel track is out, renew or straighten parts involved. Broken tube will be self-evident. |

# Chapter 7 Wheels, brakes and tyres

**Contents**


| | | | |
|---|---|---|---|
| General description | 1 | Front brake master cylinder: removal, renovation and reassembly | 11 |
| Front wheel: examination and renovation | 2 | Rear brake master cylinder: removal, renovation and reassembly | 12 |
| Front brake assembly: examination and renovation | 3 | Bleeding the hydraulic brake system | 13 |
| Front brake disc: examination and replacement | 4 | Rear wheel sprocket: removal, examination and replacement | 14 |
| Front wheel bearings: dismantling, examination and reassembly | 5 | Final drive chain: examination and lubrication | 15 |
| Front wheel: reassembly and replacement | 6 | Chain oiler: adjustment | 16 |
| Rear wheel: examination, removal and renovation | 7 | Tyres: removal and replacement | 17 |
| Rear brake assembly: examination and renovation | 8 | Wheel balancing | 18 |
| Rear wheel bearings: dismantling, examination and reassembly | 9 | Fault diagnosis: wheels, brakes and tyres | 19 |
| Replacing the rear wheel | 10 | | |


**Specifications**

| | FL and FLH | FX and FXE |
|---|---|---|
| **Tyres** | | |
| **Size:** | | |
| Front | 5.10 x 16 | 3.75 x 19 |
| Rear | 5.10 x 16 | 5.10 x 16 |
| **Make** | Goodyear Speed Grip (5.10 x 16)<br>Goodyear MM90-19 Sport Rib (3.75 x 19)<br>Yokohama &-980 High Speed (3.75 x 19) | |
| **Pressures:** | | |
| Front | 20 psi | 24 psi |
| * Rear | 24 psi | 24 psi |

* Increase rear tyre pressure by 2 psi when carrying a passenger. When carrying passenger or extra load over 150 lbs, increase rear tyre pressure by 2 psi and front tyre pressure by 1 psi for each additional 50 lbs carried.

| | |
|---|---|
| **Brakes** | |
| **Type:** | |
| Front | Hydraulically operated disc brake |
| Rear | Hydraulically operated disc brake |
| **Size:** | |
| Front | 10 inch FL and FLH, 11.5 inch FX and FXE |
| Rear | 10 inch all models |

## 1 General description

1 The front wheel fitted to the Electra Glide models has a diameter of 16 inches, also the rear wheels of all the models covered in this manual. The 16 inch wheel is fitted with a 5.10 cover. A 19 inch diameter front wheel with a 3.75 inch cover is fitted to all Super Glide models.

The standard wheel is comprised of a steel rim laced to an aluminium hub which runs on two taper roller bearings. On Electra Glide models, cast aluminium alloy wheels are available as an extra, to which the standard components such as bearings and brake discs are fitted. A single hydraulically operated disc brake is fitted both at the front and the rear, the caliper unit being identical on all but post 1974 Super Glide models, whose front brake caliper is different.

## 2 Front wheel: examination and renovation

1 As the machine has no centre stand, a firm support must be placed under the frame, in the vicinity of the engine unit, so that the machine will stand securely, with the front wheel off the ground. Note that it may be necessary to arrange some outrigger supports if the machine is not too stable; the lower frame tubes are close together and do not provide an over large base.

2 Spin the wheel and check the rim alignment. Small irregularities can be corrected by tightening the spokes in the affected area although a certain amount of experience is necessary to prevent over-correction. Any flats in the wheel rim will be evident at the same time. These are more difficult to remove and in most cases it will be necessary to have the wheel rebuilt on a new rim. Apart from the effect of stability, a flat will expose the tyre bead and walls to greater risk of damage if the machine is run with a deformed wheel.
3 Check for loose and broken spokes. Tapping the spokes is the best guide to tension. A loose spoke will produce a quite different sound and should be tightened by turning the nipple in an anticlockwise direction. Always check for run out by spinning the wheel again. If the spokes have to be tightened by an excessive amount, it is advisable to remove the tyre and tube as detailed in Section 12 of this Chapter. This will enable the protruding ends of the spokes to be ground off, thus preventing them from chafing the inner tube and causing punctures.

## 3 Front brake assembly: examination and renovation

1 Before the disc brake pads can be examined for wear, it is necessary to separate the front disc brake caliper by removing the hose clamp and two or four screws that hold the two halves of the assembly together. Lift away the outer half of the caliper, together with the small damper spring. Then remove the mounting pin and the inner caliper half. Take out the brake pad mounting pins and the brake pads.
2 Check the pads for wear, damage or slackness. Check also that the metal backing pad is flat and not distorted. If the pads have worn by more than 1/16th inch when measured against a new pad, renew them BOTH.

On post-1973 Super Glide models the brake pads have a wear indicator groove provided on each pad. If either pad has worn down to the groove, the pads must be renewed as a set. Each pad is retained by two rivets which may be removed by using a 9/64 inch drill bit. Care should be taken not to drill the hole off-centre and so enlarge the rivet holes in the pad carrier. When renewing the pads, it is important that the rivets are quite tight or they will shear in service.
3 Whilst the caliper assembly is apart, it is also convenient to check the movement of the piston in the outer caliper half. Mount a dial gauge on the back of the outer caliper, so that the plunger rests on the piston face. Apply the handlebar lever gently until the piston is extended, and set the gauge to zero. Release the brake lever. If the piston movement is not restricted it should retract within the range 0.020 in - 0.025 in.
4 If piston movement is restricted or sluggish, or if there are signs of hydraulic fluid leakage, it will be necessary to remove

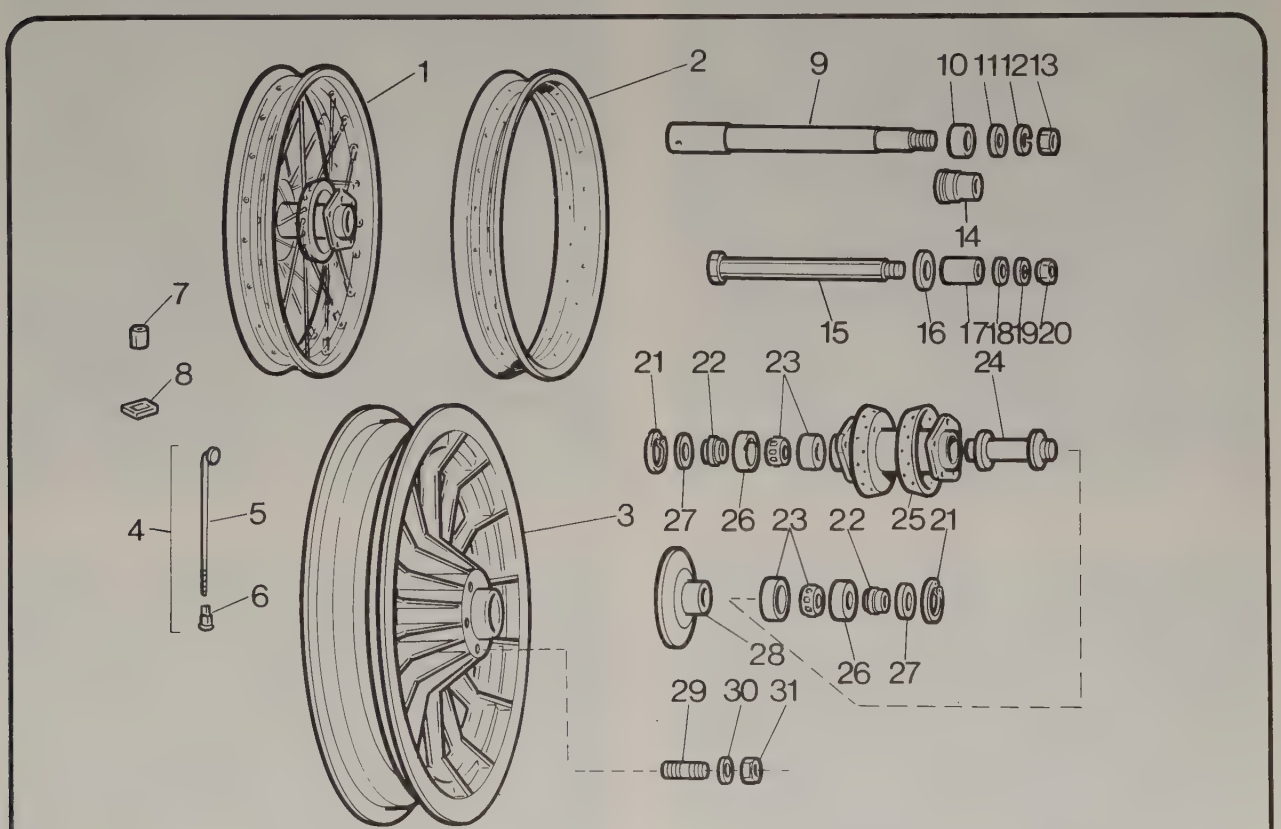



Fig. 7.1. FL/FLH interchangeable wheels

1 *Wheel - complete*
2 *Rim*
3 *Cast alloy wheel - optional 1973 on*
4 *Spoke set - 40 off*
5 *Spoke - 40 off*
6 *Nipple - 40 off*
7 *Balance weight (wire wheel) - ar*
8 *Balance weight (alloy wheel) - ar*
9 *Front wheel spindle*
10 *LH wheel spacer*
11 *Plain washer*
12 *Spring washer*
13 *Nut*
14 *RH wheel spacer*
15 *Rear wheel spindle*
16 *Plain washer*
17 *LH wheel spacer*
18 *Plain washer*
19 *Spring washer*
20 *Sleeve nut*
21 *Circlip - 4 off*
22 *Spacer - 4 off*
23 *Tapered bearing - 4 off*
24 *Bearing spacer*
25 *Hub - 2 off*
26 *Oil seal - 4 off*
27 *Backing washer - 4 off*
28 *Hub cap - cast wheel*
29 *Stud - 5 off*
30 *Serrated washer - 5 off*
31 *Nut - 5 off*

the piston to give the assembly further attention. Drain the hydraulic fluid by opening the bleed valve and pumping it out by alternately depressing and releasing the handlebar lever. When it has drained off, push the piston boot back from its groove in the piston and pull the piston the remainder of the way out.

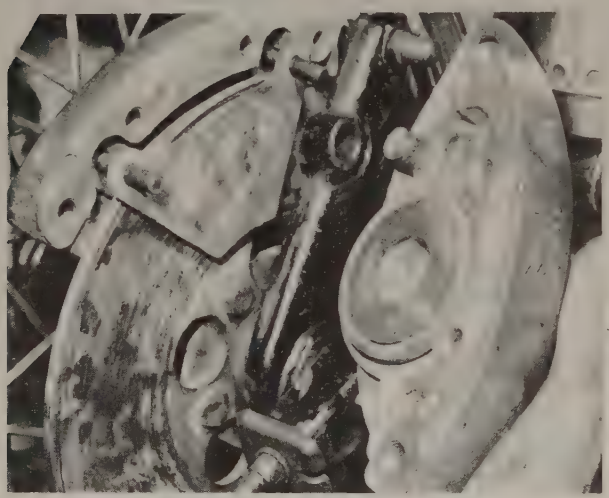
**Caution:** Brake fluid is a highly efficient paint stripper. Keep it away from paintwork and plastic, especially the transparent lenses of instruments and lamps.

5 Using a pair of external circlip pliers, remove the retaining ring of the piston, the backing plate, wave spring, adjusting ring and 'O' ring. Unscrew the bleeder valve from the caliper outer half, then immerse the whole assembly and all the component parts in clean solvent, taking great care not to scratch the piston or its housing. If the bore in which the piston slides or the piston itself is scored, it must be renewed.

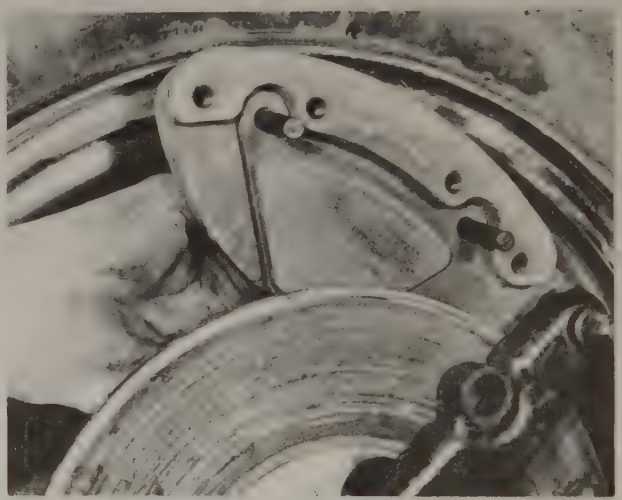
6 Reassemble in the reverse order of dismantling, using a new 'O' ring seal and adjusting ring for the piston. Lubricate the working parts in clean hydraulic fluid. Close the bleed valve, after refitting the piston. Apply a small amount of graphite grease to the pins upon which the caliper floats.

7 After the caliper assembly has been replaced fill the master cylinder with brake fluid and bleed the system of air as described in Section 13 of this Chapter.

3.1a Remove the four bolts to allow ...



3.1b ... separation of the caliper halves



3.1c Lift the brake pads off the pins

## 4 Front brake disc: examination and replacement

1 The front brake disc is retained to the front wheel hub by five bolts and lock washers. Before the disc and disc spacer can be removed, the wheel itself must be detached from the front forks, as described in Chapter 6, Section 2.3.

2 The disc will rarely require attention, but it should be checked periodically for run-out and thickness. If the run-out is more than 1/32nd inch at any point, or if the disc has worn below 3/16th inch (0.188 in) thickness, it must be renewed.

3 When reassembling, use new lock washers and tighten the retaining bolts to a torque wrench setting of 35 ft lb (4.838 kg m).

## 5 Front wheel bearings: dismantling, examination and reassembly

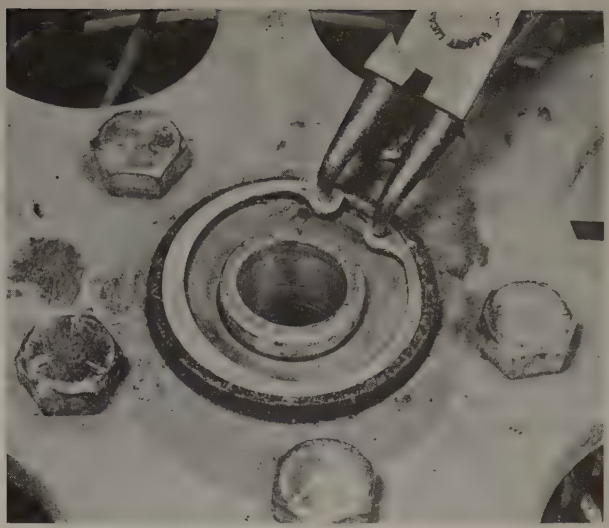
1 It is convenient to examine the front wheel bearings whilst the front wheel is removed from the forks. Working from either side of the hub remove the circlip and washer (where fitted) and then pull out the spindle spacer. Prise out the oil seal with a screwdriver, and lift the tapered bearing inner race from position. Repeat the procedure for the opposite side of the hub. Do not allow the bearings to be interchanged; a bearing inner race must always be refitted in the original outer race with which it is matched.

2 Removal of the outer races from the hub requires a special puller, in order to preclude the risk of damage to the bearings. Check therefore that the bearings require renewal before removing them from the hub.

3 Remove all the old grease from the hub and bearings, giving the latter a final wash in petrol. Check the bearings for play or any signs of roughness as they are rotated. If there is any doubt about their condition, renew them.

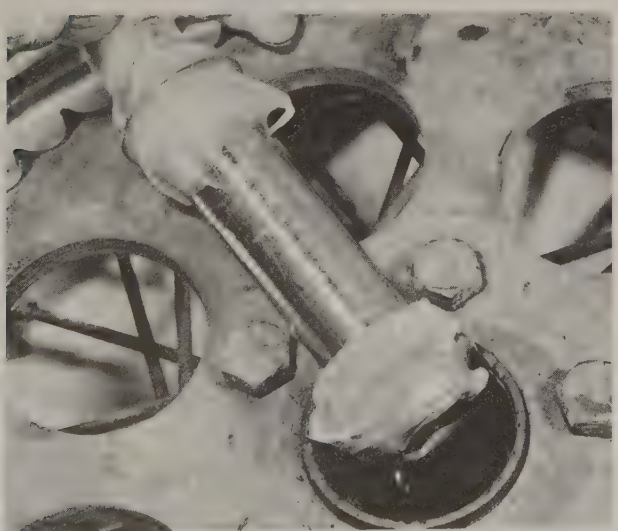
4 Before driving the bearings back into the hub, pack the hub with new grease and also grease the bearings. Use the same drift to drive them back into position, not forgetting the hollow spacer between them. Refit any oil seals or dust covers which have been displaced. The correct endfloat on the bearings is 0.005 - 0.014 in (0.127 - 0.355 mm) when assembled correctly. Alternative bearing spacers may be fitted to provide the correct clearance.

4.2 Disc wear limit


5.1a Remove the internal circlip to ...

5.1b ... gain access to dust excluder plate

5.1c Oil seal may be prised or drifted out


5.5a Regrease bearing spacer and ...

5.5b ... bearings thoroughly before refitting

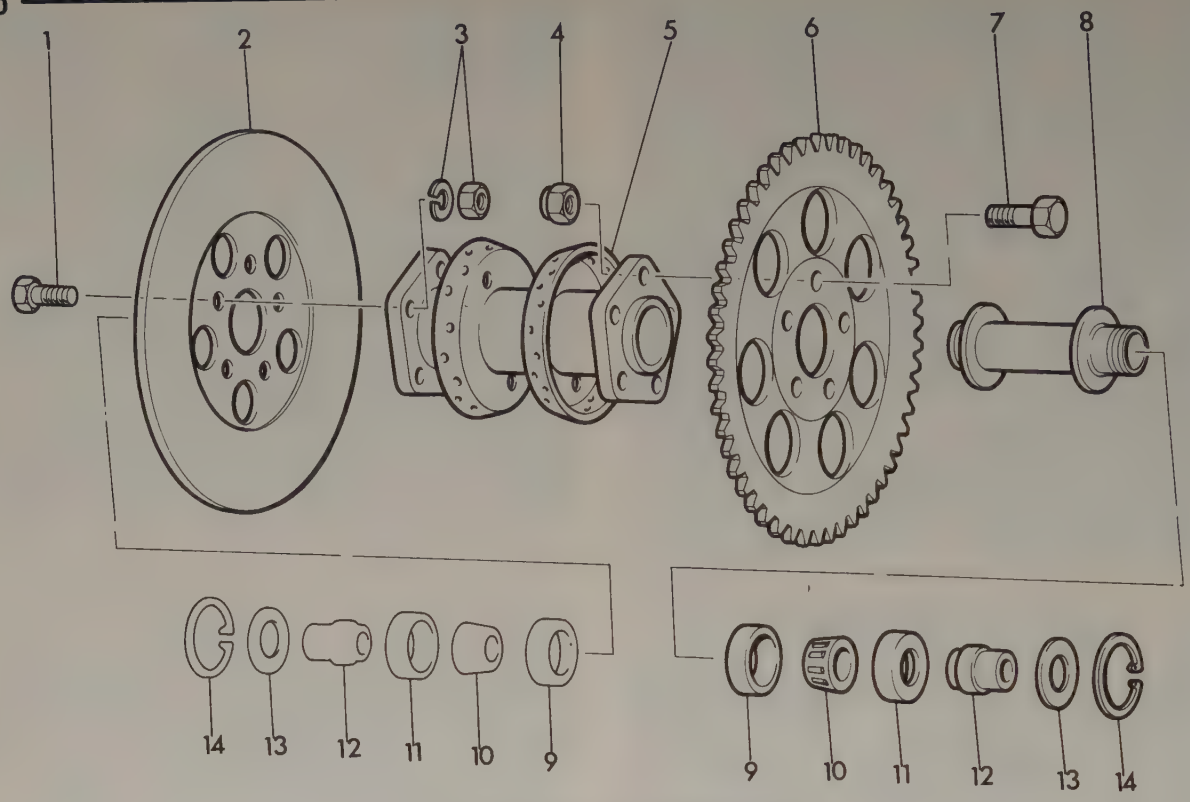



**Fig. 7.2. FX rear wheel hub assembly - 1973 on**

*1 Bolt - 5 off*
*2 Brake disc*
*3 Nut/washer - 5 off*
*4 Nut - 5 off*
*5 Hub*
*6 Rear wheel sprocket*
*7 Bolt - 5 off*
*8 Bearing spacer*
*9 Bearing outer race - 2 off*
*10 Bearing inner race - 2 off*
*11 Oil seal - 2 off*
*12 Oil seal, collar - 2 off*
*13 Backing washer - 2 off*
*14 Circlip - 2 off*

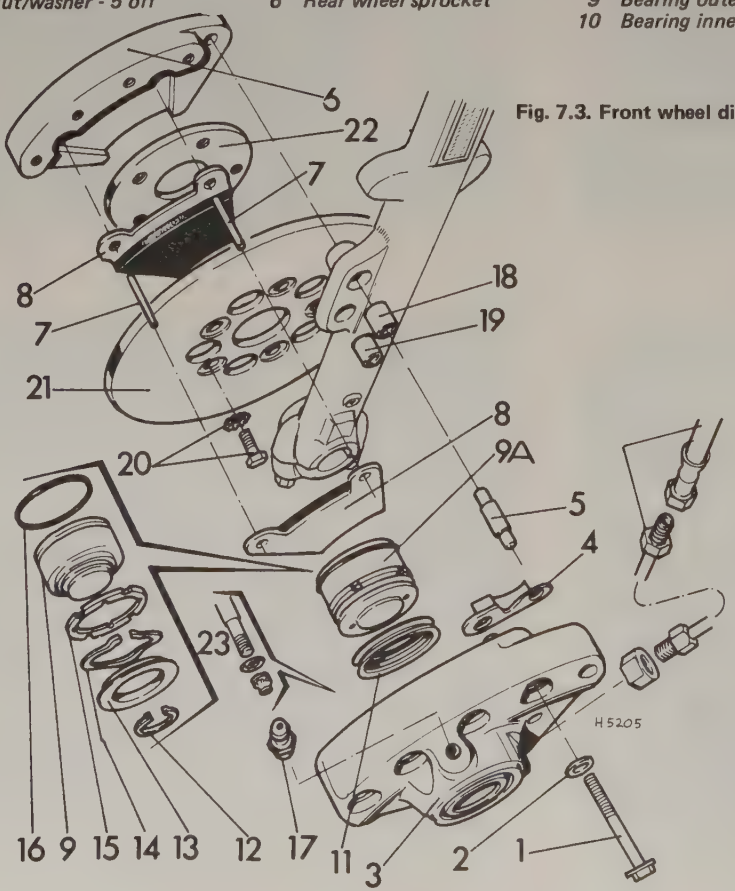



**Fig. 7.3. Front wheel disc brake - all FL, FLH and FX models to 1973**

*1 Bolt - 4 off*
*2 Washer - 4 off*
*3 Outer caliper half*
*4 Damper spring*
*5 Mounting pin*
*6 Inner caliper half*
*7 Brake pad mounting pins - 2 off*
*8 Brake pads - 2 off*
*9 Brake piston*
*9a Brake piston assembly*
*10 Hydraulic line*
*11 Piston boot*
*12 Retaining ring*
*13 Backing plate*
*14 Wave spring*
*15 Friction ring*
*16 'O' ring*
*17 Bleeder valve*
*18 Bush*
*19 Bush*
*20 Bolt and lock washer - 6 off*
*21 Brake disc*
*22 Brake disc spacer*
*23 Replacement mounting pin*

## 6 Front wheel: reassembly and replacement

1 On all but post-1974 Super Glide models, the brake caliper may be refitted either before or after the wheel has been replaced. On the later Super Glide models the wheel must be replaced first.
2 When replacing the front wheel on Super Glide models, ensure that the speedometer gearbox drive dogs engage correctly with the hub.

## 7 Rear wheel: examination, removal and renovation

1 Rearrange the packing under the centre of the machine so that the machine stands firmly on level ground, with the rear wheel clear of the ground. Check for rim alignment, damage to the rim and loose or broken spokes by following the procedure relating to the front wheel, description in Section 2 of this Chapter.
2 To remove the rear wheel, follow the procedure described in Chapter 6, Section 10, paragraph 6.

## 8 Rear brake assembly: examination and renovation

1 The rear brake caliper and disc are identical to the unit fitted to the front wheel of all but the post-1974 Super Glide models. The damper spring fitted to the front brake caliper is, however, omitted on the rear assembly.
2 When inspecting and overhauling the brake assembly, refer to the relevant passages in Sections 3 and 4 of this Chapter. Note that the caliper piston movement is correct when within the range 0.033 - 0.038 in (0.838 - 0.965 mm).

## 9 Rear wheel bearings: dismantling, examination and reassembly

1 The rear wheel bearings are of the same type as those fitted to the Electra Glide front wheel. The arrangement for retention is identical as is the method of inspection and cleaning. Refer to Section 5 of this Chapter for the relevant details.

## 10 Replacing the rear wheel

1 The rear wheel can be replaced either before or after the brake caliper has been refitted.
2 Replace the final drive chain, positioning the ends in the teeth of the rear wheel sprocket to make the fitting of the spring connecting link easy. The closed end of the spring must face the direction of travel of the chain.
3 Check, and if necessary, adjust the chain tension, as described in Section 14. If the chain adjusters have not been disturbed, it is probable that no adjustment will be necessary on this occasion.

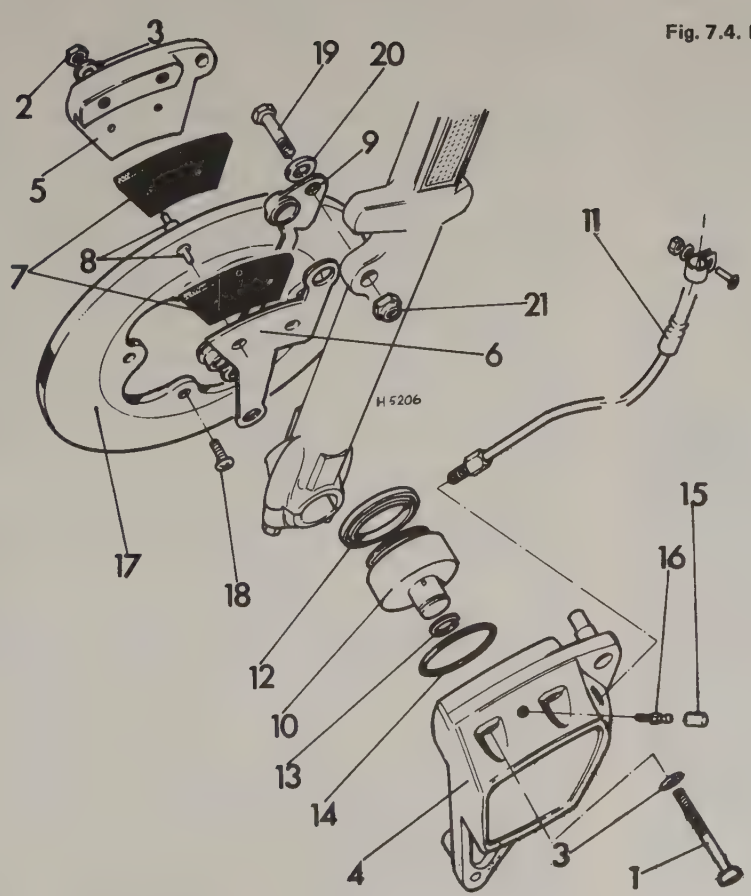



**Fig. 7.4. Front wheel disc brake - FX models - 1974 on**

1 *Socket head screw - 2 off*
2 *Locknut - 2 off*
3 *Washer - 4 off*
4 *Outer caliper half*
5 *Inner caliper half*
6 *Pressure plate*
7 *Brake pad - 2 off*
8 *Rivet - 4 off*
9 *Torque arm*
10 *Piston*
11 *Hydraulic hose*
12 *Rubber boot*
13 *Friction ring*
14 *'O' ring*
15 *Bleeder valve cap*
16 *Bleeder valve*
17 *Brake disc*
18 *Brake disc mounting screw - 5 off*
19 *Torque arm mounting bolt*
20 *Torque arm mounting bolt washer*
21 *Torque arm mounting bolt locknut*

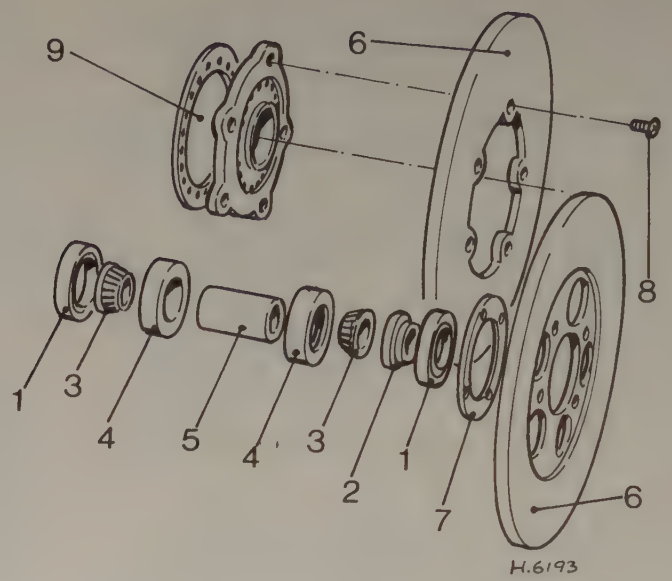



**Fig. 7.5. Front wheel hub (FX models only)**

*1 Oil seal - 2 off*
*2 Spacer*
*3 Bearing cone - 2 off*
*4 Bearing cup - 2 off*
*5 Bearing spacer*
*6 Brake disc*
*6a Brake disc*
*7 Brake disc spacer*
*8 Countersunk screw*
*9 Hub*

## 11 Front brake master cylinder: removal, renovation and reassembly

1 The hydraulic front brake master cylinder is attached to the right-hand side of the handlebars, of which the front brake lever forms part. This unit does not normally require attention, unless leakage is evident from any of the internal seals. Although repairs can be effected, they have to be carried out under surgically clean conditions and it cannot be overstressed that the operative should have both the experience and capability of undertaking such repairs. If there is any reason for doubt, it is preferable to purchase a complete, new replacement.

2 Commence operations by removing the master cylinder cover and gasket, the former being retained by two screws. Remove the handlebar switch assembly that forms the upper half of the unit, and disconnect the stop lamp wires. Drain the hydraulic system by unscrewing the bleed valve and catch the emerging fluid in a clean container. It can be reused, provided it is left in a sealed container for at least 24 hours, to de-aerate. If it has been in the machine for a long time, it is preferable to refill later with new fluid as brake fluid gradually absorbs water vapour.

3 Remove the retaining ring and pivot pin, so that the handlebar lever can be detached. It will pull out together with the brake lever trunnion, plunger, spring, two washers and dust wiper. If the retaining ring within the brake lever housing is now removed, the piston, 'O' ring, piston cup, spring cup and return spring will pull out. Take great care when removing the piston as if either the piston or its housing are scored, the assembly will be rendered useless.

4 The parts most likely to suffer damage are the piston cup and 'O' ring, and they should be checked for wear, softening or enlargement. Check that neither the piston nor its bore are scratched or grooved; either defect will necessitate renewal. If a repair kit is purchased for reconditioning the master cylinder assembly, use ALL the parts as a safeguard against unseen wear. All gaskets must be in perfect order and the vent hole in the master cylinder cover must be clear. If air cannot get in, fluid cannot get out!

5 Reassemble in the reverse order of dismantling, using clean brake fluid to lubricate all the working parts. Remember, assembly must take place in ultra-clean conditions, or damage will inevitably occur. When assembly is complete, refill the system with hydraulic brake fluid and bleed the system of air, using the method described in the following Section. Before adding fluid check to make sure the relief port in the master cylinder is uncovered as the brake lever is released. **THIS IS MOST IMPORTANT.**

## 12 Rear brake master cylinder: removal, renovation and reassembly

1 The rear brake hydraulic master cylinder works on a principle similar to that of the front brake. Movement of the rear brake foot pedal is transmitted to the master cylinder piston via a short plunger rod interconnected by a clevis fork and pin.

2 On Electra Glide models, the master cylinder is retained on a mounting plate by two studs, one of which also incorporates the right-hand footboard front mounting point.

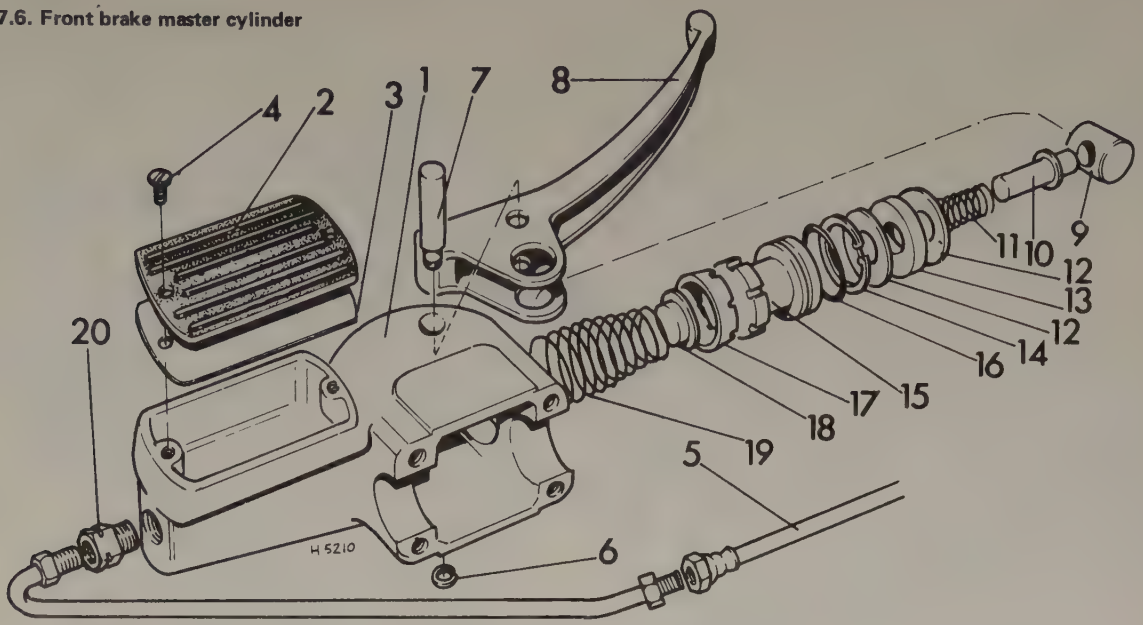
3 Remove the plated cover from the master cylinder where it is retained by a single bolt. Disconnect the brake pipe at the cylinder and allow the small amount of escaping fluid to drain onto a rag. Detach the footboard by removing the two pivot bolts. After removal of the two mounting studs, the master cylinder may be moved forwards so that the operating rod leaves the protective boot.

4 The master cylinder on Super Glide models is mounted to the rear of the gearbox, where it is retained on a bracket by two bolts. Because of the master cylinders close proximity to the exhaust system, an insulating block is retained on the reservoir wall which is retained by the two mounting bolts. Depending on the model, and hence the type of exhaust system used, the exhaust pipe or silencer may prevent access to the master cylinder and so prevent its removal. In this case, the exhaust system must be removed. Removal of the master cylinder is as given for Electra Glide models.

5 On all models, the master cylinder may be dismantled as follows: Remove the filler cap and pour out the brake fluid. Pull the rubber boot off the piston housing boss. The piston components are retained by a circlip, after the removal of which the various cups and seals, and the piston, may be removed.

6 The method of inspection and reassembly is described in the previous Section.

Fig. 7.6. Front brake master cylinder




| | | | |
|---|---|---|---|
| *1 Master cylinder casting* | *6 Retaining ring* | *11 Spring* | *16 'O' ring* |
| *2 Master cylinder cover* | *7 Pivot pin* | *12 Washer* | *17 Piston cup* |
| *3 Gasket* | *8 Brake lever* | *13 Dust wiper* | *18 Spring cup* |
| *4 Cover screw - 2 off* | *9 Pin* | *14 Retaining ring* | *19 Spring* |
| *5 Hydraulic line* | *10 Plunger* | *15 Piston* | *20 Union fitting* |

## 13 Bleeding the hydraulic brake system

1 A mushy feeling at either brake lever can often be traced to air in the brake system. Brake fluid is not easily compressed, so that when the brake lever is operated, almost all of the force applied to the lever is transmitted to the brake caliper. Air on the other hand compresses more easily, so that any air in the system compresses before the fluid will. This also means that some of the lever travel is wasted as it is used in compressing air without actually applying force to the caliper.

2 The brake system should be bled whenever the action of a brake feels spongy, whenever brake fluid is changed, or whenever a brake line fitting has been loosened or disconnected. Bleed the hydraulic brake system in the following manner.

3 Remove the master cylinder cover and check that there is plenty of fluid in the reservoir. The brake fluid level must be checked several times during the bleeding operation, and replenished as necessary. If the fluid in the master cylinder reservoir runs out at any time, during the bleeding operation, air will enter the system and the procedure will have to be started all over again.

4 Use only new brake fluid. Do not use fluid that has been left unsealed in a container for any length of time. Use only the type of fluid recommended in this manual. **Caution:** Brake fluid must not be spilled on painted surfaces; it will strip the paint and should therefore be wiped off immediately.

5 Slowly pump the brake lever until no air bubbles can be seen rising up through the fluid from the bottom of the reservoir. When no more bubbles appear, the master cylinder end of the brake system has been purged of air.

6 Replace the master cylinder cover and run a clear plastic hose from the caliper bleeder valve into a container containing some brake fluid. The bottom of the hose must remain immersed throughout the whole operation. Unscrew the bleed nipple one turn and pump the front brake lever until no more air bubbles can be seen emerging from the plastic hose. Tighten the bleed nipple whilst the brake lever is operated fully. During this process repeatedly check the fluid level in the reservoir, and replenish it as necessary.

7 When the system has been bled, replace the rubber cap on the bleeder valve, and check the fluid level in the reservoir once more.

## 14 Rear wheel sprocket: removal, examination and replacement

1 The rear wheel sprocket is retained on the rear hub by five bolts and nuts, and removal is therefore straightforward.

2 Check the sprocket teeth for chipping, breakage or hooking. If wear is evident, the sprocket should be renewed.

3 Note that if the rear wheel sprocket requires renewal, it is probable that the gearbox final drive sprocket is also in need of attention. It is preferable to renew both sprockets at the same time, and fit a new chain. This will obviate the risk of old and new parts running together, resulting in a more rapid rate of wear and renewal after only a reduced period of service.

13.7 Always replace rubber cap on bleed nipple

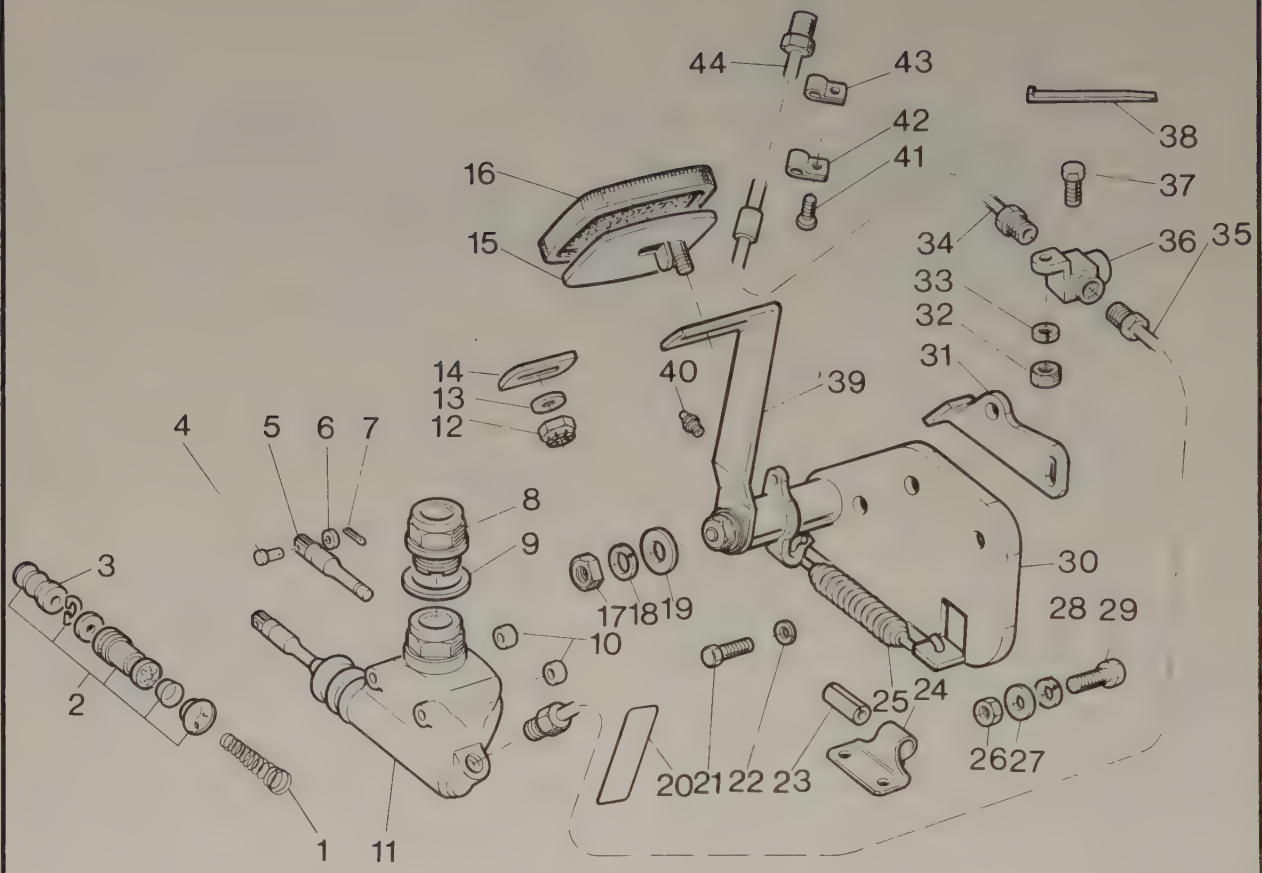



**Fig. 7.7. Rear brake master cylinder - FL and FLH models**

1 *Spring*
2 *Piston components - complete*
3 *Boot*
4 *Clevis pin*
5 *Plunger*
6 *Washer*
7 *Split pin*
8 *Filler cap*
9 *Sealing washer*
10 *Spacer - 2 off*
11 *Master cylinder*
12 *Castellated nut*
13 *Washer*
14 *Spacer plate*
15 *Brake pad*
16 *Rubber*
17 *Nut*
18 *Spring washer*
19 *Plain washer*
20 *Warning label*
21 *Bolt*
22 *Spring washer*
23 *Rubber sleeve*
24 *Clip*
25 *Return spring*
26 *Nut*
27 *Plain washer*
28 *Spring washer*
29 *Bolt*
30 *Mounting plate*
31 *Stop plate*
32 *Nut*
33 *Spring washer*
34 *Rear brake pipe*
35 *Front brake pipe*
36 *Junction block*
37 *Bolt*
38 *Strap*
39 *Brake lever*
40 *Grease nipple*
41 *Bolt*
42 *Clip*
43 *Clip*
44 *Rear brake hose*

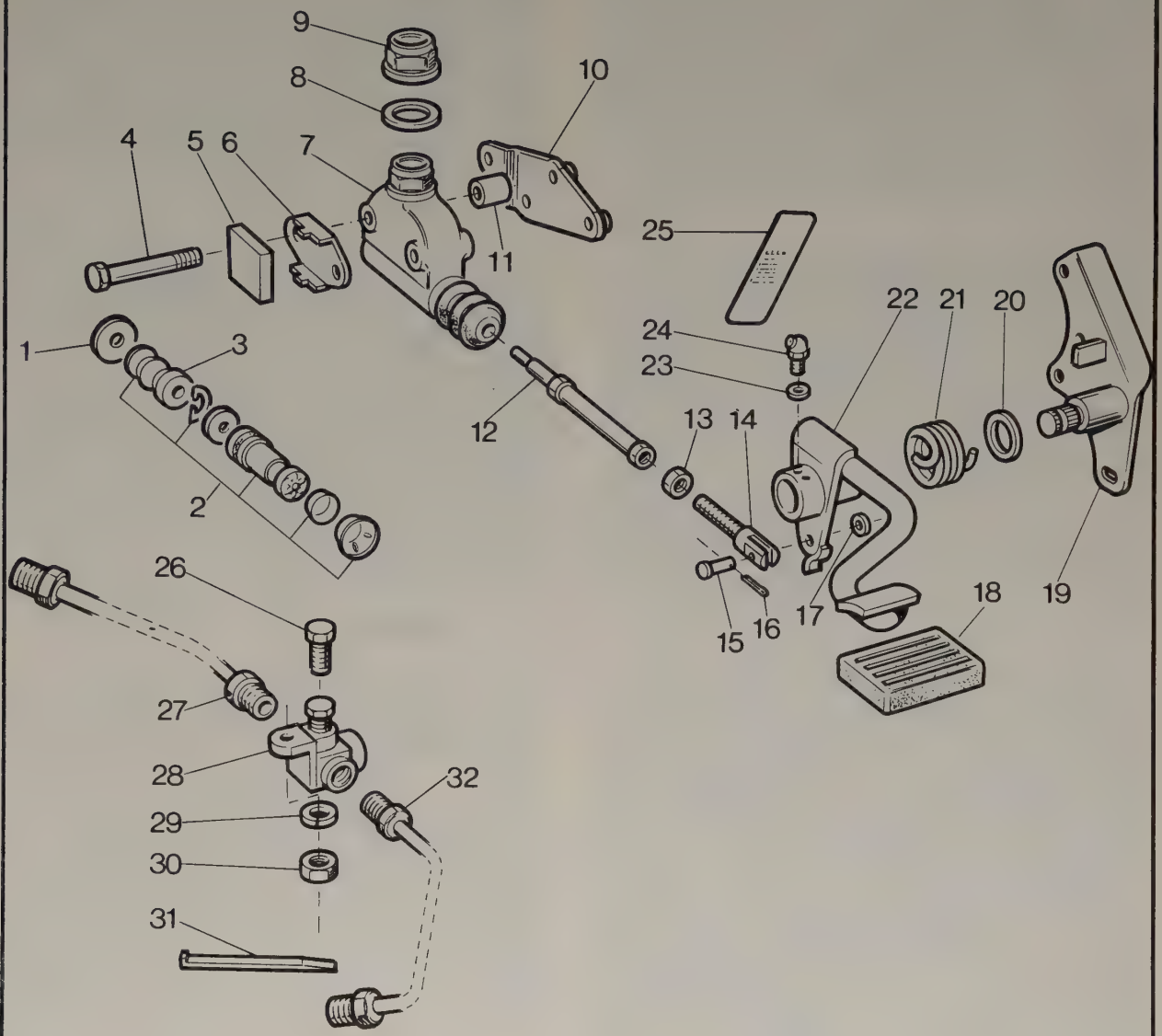
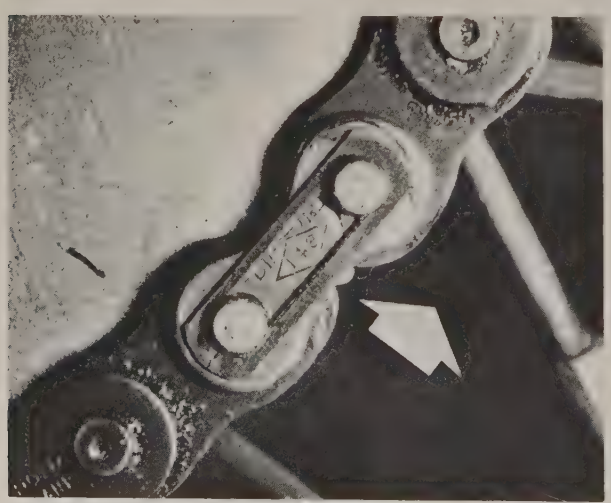



**Fig. 7.8. Rear brake master cylinder - FX and FXE models**

1 *Rubber washer*
2 *Piston components - complete*
3 *Boot*
4 *Bolt - 2 off*
5 *Heat sink*
6 *Holder*
7 *Master cylinder*
8 *Sealing washer*
9 *Filler cap*
10 *Mounting bracket*
11 *Spacer - 2 off*
12 *Plunger*
13 *Locknut*
14 *Clevis rod*
15 *Clevis pin*
16 *Split pin*
17 *Washer*
18 *Rubber*
19 *Footrest/pedal bracket*
20 *Washer*
21 *Return spring*
22 *Brake pedal*
23 *Sealing washer*
24 *Grease nipple*
25 *Warning label*
26 *Bolt*
27 *Pipe*
28 *Junction block*
29 *Spring washer*
30 *Nut*
31 *Strap*
32 *Pipe*

### 15 Final drive chain: examination and lubrication

1 The final drive chain is fully exposed, apart from a little protection afforded along the upper run by the rear chainguard. It is lubricated by an adjustable chain oiler, which permits engine oil to drip onto the chain at regular intervals.
2 Irrespective of the amount of protection provided, the chain tension will need adjustment at regular intervals, to compensate for wear. This is accomplished by slackening the rear wheel nut and the caliper bracket torque arm nut. The draw bolt adjusters in each rear fork end are used to draw the wheel backwards until the chain is again under correct tension. Note that it may be necessary to slacken the rear brake torque arm bolt during this operation.
3 Chain tension is correct if there is from 3/8 - 5/8 inch of slack in the middle of the upper arm. Always check the chain at its tightest point; a chain rarely wears in an even manner during service.
4 Always adjust the draw bolts an even amount so that correct wheel alignment is preserved. If desired, wheel alignment can be checked by running a plank of wood parallel to the machine so that it touches both walls of the rear tyre. If wheel alignment is correct, it should be equidistant from either side of the front wheel tyre when tested on both sides of the rear wheel. It will not touch the front tyre because this tyre has a smaller cross section. See the accompanying diagram.
5 Do not run the chain overtight to compensate for uneven wear. A tight chain will place excessive stresses on the gearbox and rear wheel bearings leading to their early failure. It will also absorb a surprising amount of power.
6 After a period of running, it is preferable to remove the chain and immerse it in a molten lubricant such as Linklyfe or Chainguard after it has been cleaned in a paraffin bath. These latter lubricants achieve better penetration of the chain links and rollers and are less likely to be thrown off when the chain is in motion.
7 To check whether the chain is due for renewal, lay it lengthwise in a straight line and compress it endwise until all play is taken up. Anchor one end, then pull in the opposite direction to take up the play which develops. If the chain extends by more than ¼ inch per foot, it should be replaced in conjunction with the sprockets. Note that this check should **always** be made after the chain has been washed out, but before any lubricant is applied, otherwise the lubricant may take up some of the play.
8 When replacing the chain on the machine, make sure the spring link is positioned correctly with the closed end facing the direction of travel.



15.6 Spring link must be fitted correctly

9 When renewal of the final drive chain is necessary, it should be noted that a Renold chain, of British manufacture, is available as an alternative to the original. When obtaining a replacement, take along the old chain as a pattern, or, if known, a note of the size and number of pitches (rollers).

### 16 Chain oiler: adjustment

1 The adjustable chain oiler will be found in the vicinity of the final drive gearbox sprocket, where it delivers oil in a metered quantity to the rear chain. It is fed by a small bore external oil pipe that taps into the rear of the timing chest.
2 Adjustment is effected by means of the small screw and lock nut in the top of the oiler. It should be set so that the oil delivers 2 to 3 drops of oil per minute, which represents a setting of approximately ¾ turn out from the fully-closed position. Turning the screw outwards (anticlockwise) increases the flow of oil and vice-versa. Beware of over-oiling which will result in excess oil being distributed over the sidewalls of the rear tyre and provoking a rear wheel slide.
3 Periodically (every 2,000 miles) the adjusting screw should be removed completely (after taking careful note of its setting) and the orifice blown out with compressed air. Refit the screw, tighten it until it bottoms, then slacken back the desired amount to restore the original setting.
4 Note that even if the chain appears to be amply lubricated, this is no guarantee that the chain oiler is still functioning correctly. A regular check is necessary, if the chain is not to wear prematurely.

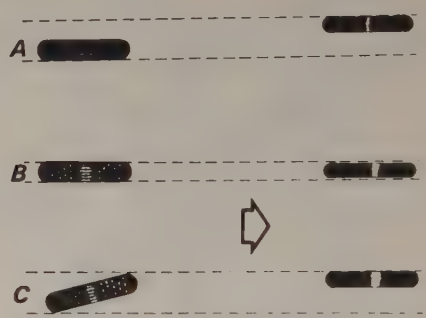
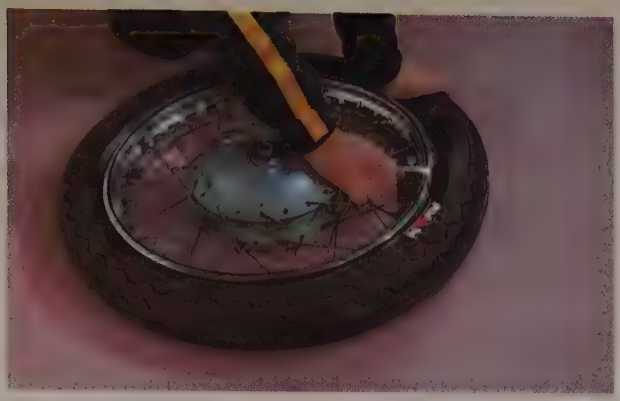



Fig. 7.9. Method of checking wheel alignment

*A and C* *Incorrect*
*B* *Correct*

15.9 An equivalent British-made chain is available, if the detachable type



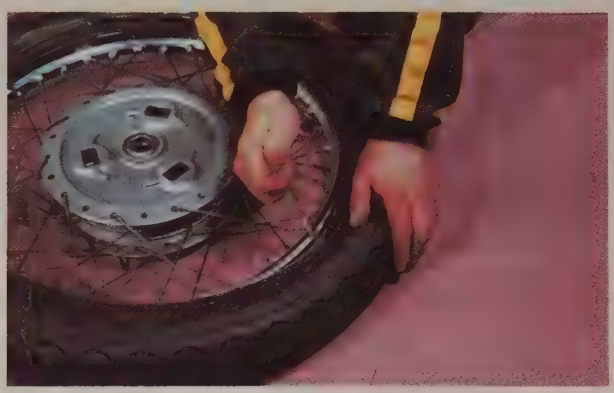
**Tyre removal:** Deflate inner tube and insert lever in close proximity to tyre valve

Use two levers to work bead over the edge of rim

When first bead is clear, remove tyre as shown

**Tyre fitting:** Inflate inner tube and insert in tyre

Lay tyre on rim and feed valve through hole in rim



Work first bead over rim, using lever in final section

Use similar technique for second bead, finish at tyre valve position

Push valve and tube up into tyre when fitting final section, to avoid trapping

## 17 Tyres: removal and replacement

1 At some time or other the need will arise to remove and replace the tyres, either as the result of a puncture or because a replacement is required to offset wear. To the inexperienced, tyre changing represents a formidable task yet if a few simple rules are observed and the technique learned, the whole operation is surprisingly simple.
2 To remove the tyre from either wheel, first detach the wheel from the machine by following the procedure in Chapter 6.2, paragraph 3 and Chapter 6.8, paragraphs 3, 6 and 7, whether the front or the rear wheel is involved. Deflate the tyre by removing the valve insert and when it is fully deflated, push the bead of the tyre away from the wheel rim on both sides so that the bead enters the centre well of the rim.

Harley-Davidson motorcycles are fitted with patented wheel rims of a type designed to prevent the tyre leaving the rim in the case of a puncture. Because of this, difficulty may be encountered when trying to push the bead of the tyre away from the rim edge. If the tyre has not been removed recently it is probable that the use of even large tyre levers will not prove effective. If available, an hydraulic press of the type used for the removal of car tyres will prove most effective. A number of heavy persons, strategically placed around the tyre wall, all jumping up and down simultaneously will often dislodge the bead. Remove the locking cap and push the tyre valve into the tyre itself.
3 Insert a tyre lever close to the valve and lever the edge of the tyre over the outside of the wheel rim. Very little force should be necessary; if resistance is encountered it is probably due to the fact that the tyre beads have not entered the well of the wheel rim all the way round the tyre.
4 Once the tyre has been edged over the wheel rim, it is easy to work around the wheel rim so that the tyre is completely free on one side. At this stage, the inner tube can be removed.
5 Working from the other side of the wheel, ease the other edge of the tyre over the outside of the wheel rim that is furthest away. Continue to work around the rim until the tyre is free completely from the rim.
6 If a puncture has necessitated the removal of the tyre, reinflate the inner tube and immerse it in a bowl of water to trace the source of the leak. Mark its position and deflate the tube. Dry the tube and clean the area around the puncture with a petrol soaked rag. When the surface has dried, apply the rubber solution and allow this to dry before removing the backing from the patch and applying the patch to the surface.
7 It is best to use a patch of the self-vulcanising type which will form a very permanent repair. Note that it may be necessary to remove a protective covering from the top surface of the patch, after it has sealed in position. Inner tubes made from synthetic rubber may require a special type of patch and adhesive if a satisfactory bond is to be achieved.
8 Before replacing the tyre, check the inside to make sure the agent which caused the puncture is not trapped. Check also the outside of the tyre, particularly the tread area, to make sure nothing is trapped that may cause a further puncture.
9 If the inner tube has been patched on a number of past occasions, or if there is a tear or large hole, it is preferable to discard it and fit a replacement. Sudden deflation may cause an accident, particularly if it occurs with the front wheel.
10 To replace the tyre, inflate the inner tube sufficiently for it to assume a circular shape but only just. Then push it into the tyre so that it is enclosed completely. Lay the tyre on the wheel at an angle and insert the valve through the rim tape and the hole in the wheel rim. Attach the locking cap on the first few threads, sufficient to hold the valve captive in its correct location.
11 Starting at the point furthest from the valve, push the tyre bead over the edge of the wheel rim until it is located in the central well. Continue to work around the tyre in this fashion until the whole of one side of the tyre is on the rim. It may be necessary to use a tyre lever during the final stages.
12 Make sure there is no pull on the tyre valve and again commencing with the area furthest from the valve, ease the other bead of the tyre over the edge of the rim. Finish with the area close to the valve, pushing the valve up into the tyre until the locking cap touches the rim. This will ensure the inner tube is not trapped when the last section of the bead is edged over the rim with a tyre lever.
13 Check that the inner tube is not trapped at any point. Reinflate the inner tube, and check that the tyre is seating correctly around the wheel rim. There should be a thin rib moulded around the wall of the tyre on both sides which should be equidistant from the wheel rim at all points. If the tyre is unevenly located on the rim, try bouncing the wheel when the tyre is at the recommended pressure. It is probable that one of the beads has not pulled clear of the centre well.
14 Always run the tyres at the recommended pressures and never under or over-inflate. The correct pressures for solo use are given in the Specificatons Section of this Chapter. If a pillion passenger is carried, increase the rear tyre pressure only by approximately 4 psi.
15 Tyre replacement is aided by dusting the sidewalls, particularly in the vicinity of the beads, with a liberal coating of French chalk. Washing up liquid can also be used to good effect but this has the disadvantage of causing the inner surfaces of the wheel rim to rust.
16 Never replace the inner tube and tyre without the rim tape in position. If this precaution is overlooked there is a good chance of the ends of the spoke nipples chafing the inner tube and causing a crop of punctures.
17 Never fit a tyre which has a damaged tread or sidewall. Apart from the legal aspects, there is a very great risk of a blow-out which can have serious consequences on any two-wheel vehicle.
18 Tyre valves rarely give trouble, but it is always advisable to check whether the valve itself is leaking before removing the tyre. Do not forget to fit the dust cap, which forms an effective second seal.
19 Very special care is needed when removing or fitting tyres to machines having alloy wheel rims. Because of their soft nature, the wheel rims are easily distorted or deformed, if undue force is used.

## 18 Wheel balancing

1 Wheel balancing should preferably be carried out on a truing stand, but as this necessitates removing the wheels, it can however be done in the machine. The front wheel can be balanced in the forks as long as the brake is free and not binding. Similarly the rear wheel can also be balanced in the swinging arm as long as the chain is removed, and the rear brake is not binding.
2 Balancing should be accomplished with balance weights, although solder can be wrapped round the spokes as a substitute. The procedure is to spin the wheel in question and see where it stops, then mark the rim at its lowest point. Do this several times to determine where the heaviest section of the wheel is. Then begin adding weight to the opposite side of the rim as a counter-balance.
3 Unless the machine is used constantly for long distance high-speed work, it is probable that only the front wheel will require attention in this manner. This is the wheel that will have by far the most noticeable effect on the handling of the machine, if it is out of balance.
4 Do not forget the wheel must be balanced with the dust cap fitted to the valve. If the tyre has a coloured spot or marking, this should be positioned by the valve, so that the tyre itself is in balance.

**19 Fault diagnosis: wheels, brakes and tyres**

| Symptom | Cause | Remedy |
|---|---|---|
| Handlebars oscillate at low speeds | Buckled front wheel | Remove wheel for specialist attention. Renew wheel (cast alloy type). |
| | Incorrectly fitted front tyre | Check whether line around bead is equidistant from rim. |
| Forks 'hammer' at high speeds | Front wheel out of balance | Add weights until wheel will stop in any position. |
| Brakes feel spongy | Air in hydraulic line | Bleed brakes. |
| | Fluid leak in system | Replace faulty part. |
| Tyres wear more rapidly in middle of tread | Over-inflation | Check pressures and run at recommended settings. |
| Tyres wear rapidly at outer edges of tread | Under-inflation | Check pressures and run at recommended settings. |

# Chapter 8 Electrical system

**Contents**


General description ... 1
Alternator: checking the output ... 2
Rectifier-regulator module: checking the performance ... 3
Battery: charging procedure ... 4
Starter motor: removal, examination and renovation ... 5
Starter motor solenoid: function and location ... 6
Starter motor driveshaft and engagement mechanism: examination and renovation ... 7
Headlamp: replacing the bulbs and adjusting the beam height ... 8
Stop and tail lamp: replacing the bulbs ... 9
Flashing indicator lamps: replacing the bulbs ... 10
Flashing indicator relay: location and replacement ... 11
Speedometer and tachometer heads: replacing the bulbs ... 12
Horn: adjustment ... 13
Handlebar switches: general ... 14
Ignition and lighting switch: general ... 15
Spotlamps: replacing the bulbs ... 16
Stoplamp switches ... 17
Fault diagnosis: electrical system ... 18


**Specifications**

| | |
|---|---|
| **Battery** | |
| Voltage | 12 v |
| Capacity | 32 ah (7 ah Super Glide only) |
| Earth connection | Negative |
| **Alternator** | |
| Type | 12 coil stator, permanent magnet rotor |
| Output | 300 watts (225 watts 1976 on) |
| **Regulator/rectifier** | |
| Make | Tympanium |
| Type | Solid state, black box |
| **Starter motor** | |
| Type | Prestolite or Hitachi |
| **Bulbs** | |
| Headlamp | 35/45 watt, 45/45 watt or 45/50 watt |
| Tail/stop lamp | 4/32 cp (5/21 watt UK) |
| Spot lamp; bulb type | 32 cp |
| sealed beam type | 30 watt |
| Flashing indicators | 32 cp |
| Indicator warning light | 1.5 cp |
| Oil pressure indicator lamp | 2 cp |
| Speedometer lamp | 2 cp |
| Generator lamp | 2 cp |
| Neutral indicator lamp | 2 cp |
| High beam indicator lamp | 2 cp |

*All bulbs rated at 12 volts.*

## 1 General description

All models covered by this manual are fitted with a 12 volt negative earth electrical system. The system consists of a twelve coil ac generator (alternator), the rotor of which is attached to the left-hand flywheel mainshaft, a combined solid state regulator-rectifier module and a battery of 7 or 32 amp hour capacity. A battery of larger capacity is fitted to the Electra Glide and FX-E Super Glide models, which are those provided with an electric starter motor.

## 2 Alternator: checking the output

1 Checking the output of the alternator and other electrical components requires the use of various electrical equipment which include a 0-20 amp ammeter, a 0-20 volt voltmeter, a variable resistor (rheostat) of 250 watt, 15 ohm resistance and an ohmmeter of good accuracy. Unless the owner has the necessary equipment and experience required in carrying out the following procedures, it is strongly recommended that the machine is returned to a Harley-Davidson specialist who will

be able to accomplish the tests without risk of damage to the components.
2 If tests are to be made, the following points should be noted. Do not run the engine with the battery disconnected, nor reverse the polarity of the battery leads. **Do not** disconnect or reconnect the alternator to rectifier-regulator module leads whilst the engine is running.
3 Machines from 1976 onwards have a similar but modified electrical system from that used on earlier models, particularly in the construction of the rectifier-regulator module. The test procedures and the results differ from one to another and care should be taken not to apply the incorrect tests to a particular type of system.
4 Connect the ammeter, voltmeter and variable resistor to the circuit as shown in the accompanying diagram. Start and run the engine at 3600 rpm and adjust the variable resistor until the output is 3.5 amperes. If the air temperature measured at the rectifier-regulator module is 75°F, the voltage reading should be between 13.8 and 15.0 volts. If this test is positive, reduce the engine speed to 2000 rpm and adjust the variable resistor so that a constant 13.0 voltage is obtained. On pre-1976 models, the current (ampage) reading should be 10.5 amps minimum, and on post-1975 models, 14 amps minimum.
5 If the above tests prove satisfactory, the alternator and the rectifier-regulator module are in good condition. If a fault is evident, the following test will ascertain by elimination whether the alternator or rectifier-regulator unit is damaged. Disconnect the alternator at the socket. On pre-1976 models run the engine at 2000 rpm. Connect a 0-150 volt ac voltmeter across the two white wire pins; the reading should be 50-100 volts. Make a similar connection across the blue and red wire pins; the reading should be 75-125 volts. On post-1975 machines connect the voltmeter across the two black lead pins. The reading should be 19-26 volts for every 1000 rpm. A satisfactory test result indicates that the alternator is in good condition.

## 3 Rectifier-regulator module: checking the performance

1 The tests carried out in paragraphs 4 and 5 in the preceding Section will ascertain whether the alternator or rectifier-regulator module is at fault. On post-1975 models satisfactory testing of the rectifier-regulator unit is impracticable. The best method of testing being by direct substitution with a replacement component. On pre-1976 machines, test the module for resistance values as shown in the following table. Make one test with a positive polarity and the second test with the polarity reversed. The module must be renewed if the values are not within the range specified.

| Probe connection | Positive polarity | Negative polarity |
|---|---|---|
| *White lead to module base* | *Infinity* | *3-15 ohms* |
| *Blue lead to black lead* | *3-15 ohms* | *Infinity* |
| *Red lead to module base* | *Infinity* | *Infinity* |

## 4 Battery: charging procedure

2 The FX model is fitted with a 7 amp hour capacity battery, whereas FX-E and Electra Glide models employ a 12 volt 32 amp hour battery, to make provision for the inclusion of an electric start facility.
3 The level of the electrolyte (battery acid) within the battery should be checked at weekly intervals, as part of the normal routine maintenance procedure. Add only distilled water to bring up the level above the plates and separators to that recommended by the battery manufacturer. Overfilling will weaken the acid and cause it to spill through the holes in the vent plugs, causing local corrosion.
4 Unless acid is spilt, as may occur if the machine falls over, the electrolyte should always be topped-up with distilled water to restore the correct level. If acid is spilt onto any part of the machine, it should be neutralised with an alkali such as washing soda or baking powder and washed away with plenty of water, otherwise serious corrosion will occur. Top-up with sulphuric acid of the correct specific gravity (1.260 to 1.280) only when spillage has occurred.
5 It is seldom practicable to repair a cracked battery case because the acid present in the joint will prevent the formation of an effective seal. It is always best to replace a cracked battery, especially in view of the corrosion which will be caused if the acid continues to leak.
6 If the machine is not used for a period, it is advisable to remove the battery and give it a 'refresher' charge every six weeks or so from a battery charger. If the battery is permitted to discharge completely, the plates will sulphate and render the battery useless.
7 The normal charge rate for the 7 amp hour battery is 1.5 amps, and for the 32 amp hour battery 4 amps. A more rapid charge rate can be given in an emergency, but this should be avoided if at all possible, since it will shorten the useful working life of the battery.
8 Never leave a battery to stand in an uncharged or 'flat' condition. Chemical changes will occur, causing the plates to sulphate and the battery to suffer a serious reduction in capacity.

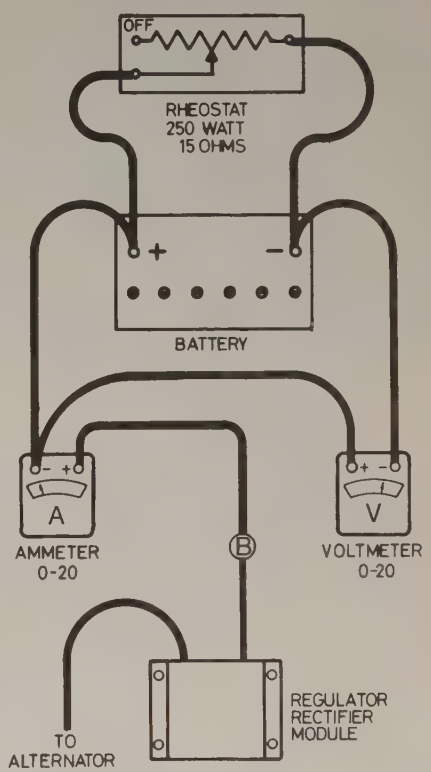



**Fig. 8.1. Checking alternator output**

## 5 Starter motor: removal, examination and renovation

1 Two different types of starter motor are in use on models that have an electric facility. Although their mode of operation is similar, one is of Prestolite (USA) manufacture and the other Hitachi (Japan). Generally speaking, the starter motor requires very little attention during the normal working life of the

machine, although periodic examination of the brushes and commutator is advisable.

2 If the starter motor refuses to function, it is advisable first to eliminate other faults that may give the impression that the starter motor alone needs attention. Check the wiring for good connections and ensure the battery is fully charged. The handlebar switch must make good contact too, as should the starter solenoid, which should engage with an audible click. Lastly, the engine itself may prove stiff to turn if it has been rebored and had new bearings fitted, if it is very cold, or if engine oil of a viscosity that is too high has been used to refill the machine.

3 To remove the starter motor from the machine first remove the battery cover and disconnect the battery. The battery must be removed followed by the carrier in order to gain access to the motor. The carrier is retained on two rubber mounted studs and two or three bolts. Disconnect the clutch cable at the operating arm and then remove the arm from the shaft projecting from the gearbox end cover. The arm is retained by a single nut.

4 Disconnect the main leads to the starter motor and then remove the outer support bracket, which is retained on the gearbox end cover. The starter motor is secured to the rear of the primary chaincase by two nuts on studs. Remove the nuts and pull the starter motor from position, leaving the driveshaft in position in the casing. Lift the starter motor driven reduction gear from the housing.

5 Remove the two nuts which retain the starter motor end cover and then unscrew the two long through bolts. Detach the reduction gear housing. With the end cover removed, it will be possible to see the brushes, which must be renewed as a set if they have worn below the following limits:

| | |
|---|---|
| Prestolite | 1/4 inch |
| Hitachi | 7/16 inch |

Make sure the brushes can move quite freely in their holders at the same time, and if not, remove them so that the holders can be cleaned with solvent to remove any build-up of carbon dust. Clean the commutator at the same time, using solvent and NOT a harsh abrasive such as emery cloth. If the starter motor has seen a considerable amount of service, the mica insulation between the individual copper segments of the commutator may now be standing proud. This must be undercut by 1/32 inch, a task requiring specialist attention. Note that when brushes are renewed, the original leads will have to be cut off close to the field coil connection (Prestolite) or unsoldered from the brush holder (Hitachi). Do not use too much heat or solder, otherwise the leads will become flow coated with solder and lose their flexibility. Before reassembly, check to make sure none of the leads contact the body of the motor or otherwise short out. Other defects will require specialist attention, or the fitting of a new replacement. This is the province of the Harley-Davidson specialist or the auto-electrical expert.

1 *Terminal nut, lockwasher and washer*
2 *Through bolt nut and lockwasher - 2 off*
3 *Through bolt and lockwasher - 2 off*
4 *Rear cover screw and lockwasher - 2 off*
5 *Rear (commutator end) cover*
6 *Terminal and insulator*
7 *Negative brush - 2 off*
8 *Positive brush - 2 off*
9 *Brush holder assembly*
10 *Front (drive end) cover*
11 *Armature*
12 *Armature ball bearing*
13 *Thrust washer*
14 *Main body shell*

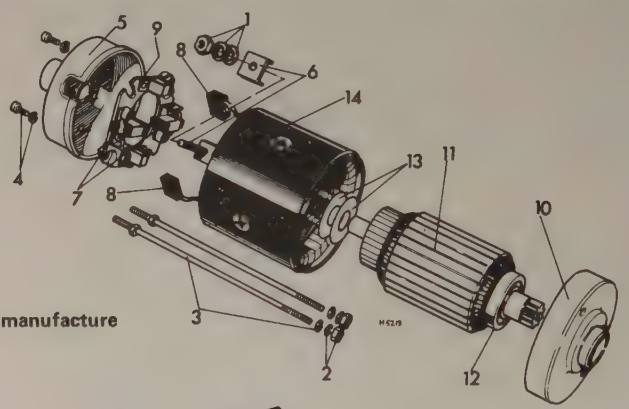


Fig. 8.2. Starter motor - Hitachi manufacture

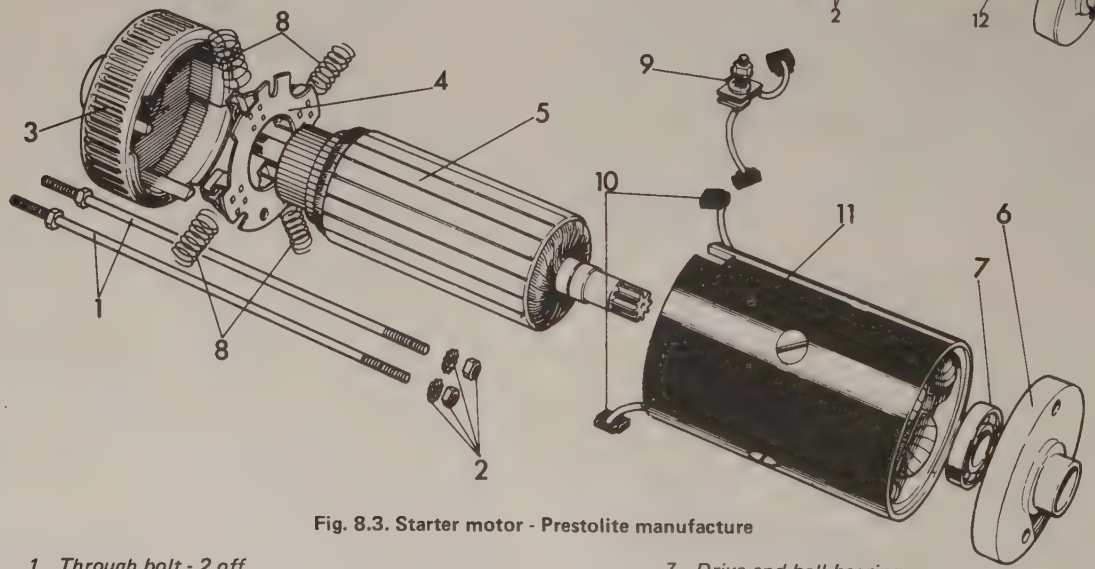
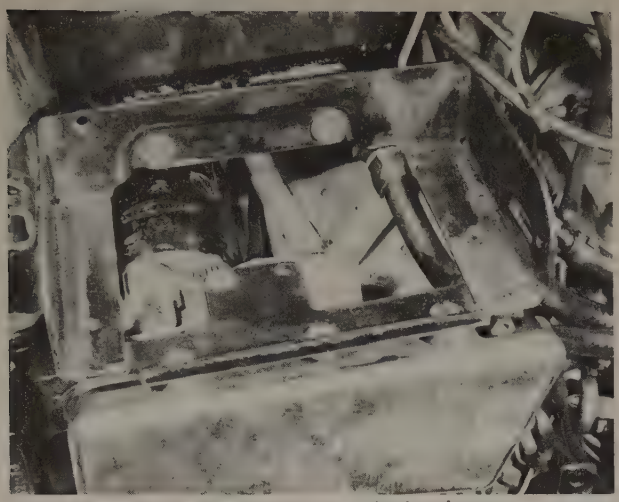


Fig. 8.3. Starter motor - Prestolite manufacture

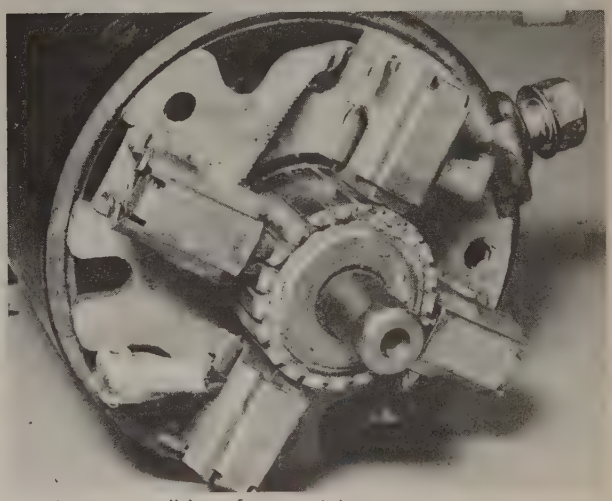
1 *Through bolt - 2 off*
2 *Washer and lockwasher - 2 off*
3 *Commutator end cover*
4 *Brush plate and holder assembly*
5 *Armature*
6 *Drive end cover*
7 *Drive end ball bearing*
8 *Brush spring - 4 off*
9 *Terminal and brush assembly*
10 *Earth brush - 2 off*
11 *Main body shell and field coil assembly*



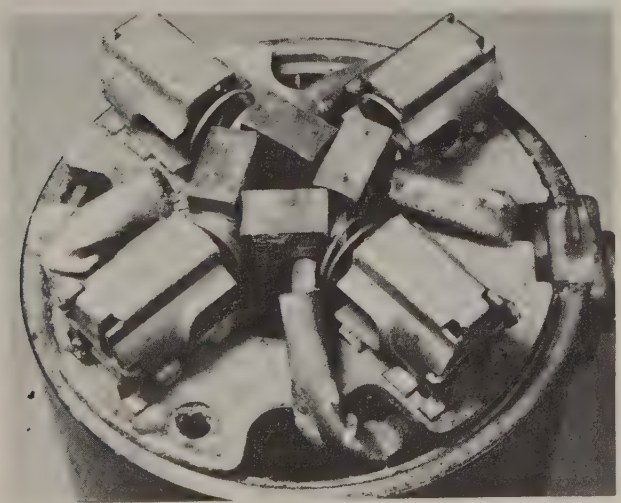
5.3a Removal of battery carrier is required, as is ...

5.3b ... removal of clutch arm to detach starter motor

5.4 Starter motor is retained on two studs



5.5a Inspect condition of commutator



5.5b Brushes will spring out on removal of armature

## 6 Starter motor solenoid: function and location

1 The starter motor switch is designed to work on the electro-magnetic principle. When the starter motor button is depressed, current from the battery passes through windings in the switch solenoid and generates an electro-magnetic force which causes a set of contact points to close. Immediately the points close, the starter motor is energised and a very heavy current is drawn from the battery.

2 This arrangement is used for at least two reasons. Firstly, the starter motor current is drawn only when the button is depressed and is cut off again when pressure on the button is eased. This ensures minimum drainage on the battery. Secondly, if the battery is in a low state of charge, there will not be sufficient current to cause the solenoid contacts to close. In consequence, it is not possible to place an excessive drain on the battery which, in some circumstances, can cause the plates to overheat and shed their coatings. If the starter will not operate, first suspect a discharged battery. This can be checked by trying the horn or switching on the lights. If this check shows the battery to be in good shape, suspect the starter solenoid switch which should come into action with a pronounced click. It is located in the back of the primary transmission housing, immediately above the clutch, and can be identified by the heavy duty starter

cable connected to it. It is not possible to effect a satisfactory repair if the switch malfunctions; it must be replaced.

## 7 Starter motor driveshaft and engagement mechanism: examination and renovation

1 The starter motor utilises a reduction gear through which the drive to the sprocket mounted on the clutch outer drum is taken. The driven reduction gear drives a shaft upon which a freely sliding engagement gear is mounted. When the starter button is operated the starter solenoid moves the engagement gear into mesh with the clutch sprocket a moment before power to the starter motor is provided. The starter solenoid operates a pivoted arm which operates the engagement gear.
2 It is necessary to remove the primary chaincase cover as described in Chapter 1.6, to gain access to the mechanism. As the assembly operates on mechanical principles any broken or worn parts should immediately be obvious.
3 To dismantle the assembly, pull the bronze thrust washer off the shaft and remove the oil seal carrier plate from the opposite end. Push the coil spring on the solenoid plunger back so that the split pin can be removed. The engagement arm pivots on a large diameter countersunk screw which screws directly into the primary chaincase inner from above. The screw is usually **very** tight and care should be exercised to avoid damaging the head.
4 Manipulate the engagement arm so that it leaves the solenoid plunger and then pull the complete shaft assembly from position. The components on the shaft can be removed after removing the special sleeve end nut.
5 The engagement components and driveshaft can be replaced by reversing the dismantling procedure. If either of the shaft needle roller bearings are worn, they must be renewed. The bearing in the starter motor end housing is particularly prone to wear as no means of lubrication is provided. Check that the 'O' ring in the shaft oil seal plate is in good condition. Renew if there is any doubt.
6 On reassembly, do not omit the bronze thrust washer on the extension of the starter motor shaft. It is a loose fit, and easily misplaced.

## 8 Headlamp: replacing bulbs and adjusting the beam height

1 On Electra Glide models the headlamp glass/reflector unit can be removed after unscrewing the single screw through the bottom of the chrome rim. If the connector block is pulled from the pins at the rear of the reflector unit, the complete assembly is then free. In order to gain access to the headlamp unit on Super Glide models, it is necessary to remove the screw through the chromium plated clamp that surrounds the headlamp, take off the clamp, then prise the reflector unit from its rubber mountings. If the connector block is pulled from the back of the reflector unit, the latter is then free from the machine.
2 Since the headlamp is a sealed beam unit, the complete reflector unit will have to be renewed when either of the headlamp bulb filaments fail. It is not possible to effect a repair, or to renew the bulb on its own, as it is an integral part of the assembly.
3 On Super Glide models, beam height is adjusted by slackening the headlamp mounting nut and twisting the headlamp assembly in the desired direction, before retightening. Check again after the nut has been tightened, in case this final operation may have altered the setting a little. The headlamp on Electra Glide models can be adjusted in any direction by turning one or more of the three screws which pass through the glass/reflector unit. The rim must be detached in order to gain access to the screws.
4 UK lighting regulations stipulate that the lighting system must be arranged so that the light will not dazzle a person standing in the same horizontal plane as the vehicle at a distance greater than 25 yards from the lamp, whose eye level is not less than 3 feet 6 inches above the plane. It is easy to approximate this setting by placing the machine 25 yards away from a wall, on a level road, and setting the beam height so that it is concentrated at the same height as the distance from the centre of the headlamp to the ground. The rider must be seated normally during this operation and also the pillion passenger, if one is carried regularly.

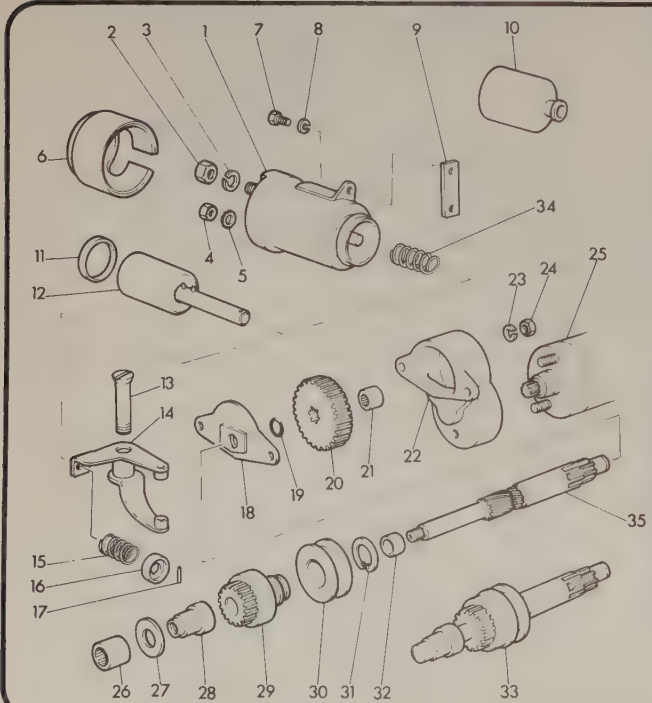
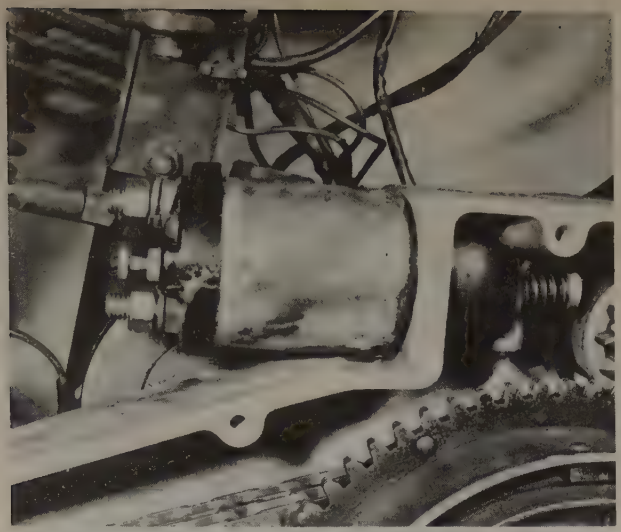
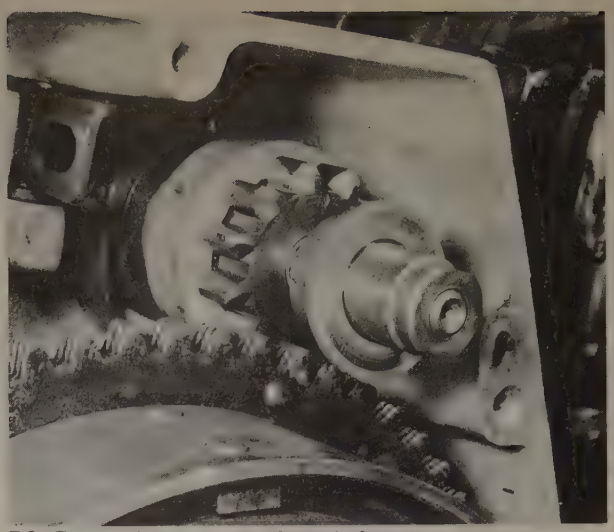



**Fig. 8.4. Starter motor solenoid and engagement mechanism**

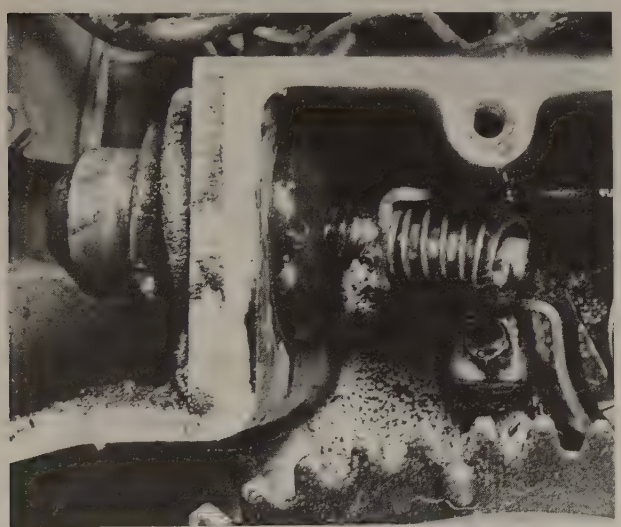
| | | | |
|---|---|---|---|
| 1 | *Solenoid* | 19 | *'O' ring* |
| 2 | *Nut - 2 off* | 20 | *Reduction driven gear* |
| 3 | *Spring washer - 2 off* | 21 | *Inner needle roller bearing* |
| 4 | *Nut* | 22 | *Reduction gearbox housing* |
| 5 | *Serrated washer* | 23 | *Spring washer - 2 off* |
| 6 | *Terminal boot* | 24 | *Nut - 2 off* |
| 7 | *Bolt - 2 off* | 25 | *Starter motor* |
| 8 | *Spring washer - 2 off* | 26 | *Outer needle roller bearing* |
| 9 | *Plate* | 27 | *Bronze washer* |
| 10 | *Plunger boot* | 28 | *Special nut* |
| 11 | *Sealing ring* | 29 | *Engagement pinion* |
| 12 | *Plunger* | 30 | *Slider* |
| 13 | *Pivot screw* | 31 | *Circlip* |
| 14 | *Engagement fork* | 32 | *Bush* |
| 15 | *Spring* | 33 | *Engagement shaft - complete* |
| 16 | *Pin cup* | 34 | *Spring* |
| 17 | *Pin* | 35 | *Engagement shaft* |
| 18 | *Oil seal plate* | | |



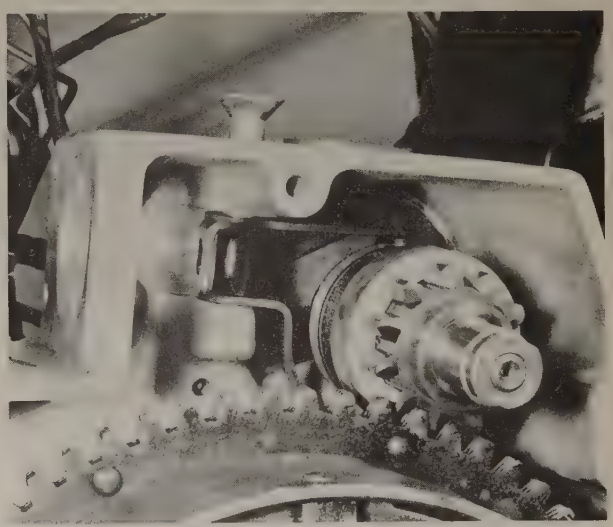
6.1 Solenoid is mounted on primary chaincase



7.3a Remove bronze washer from shaft

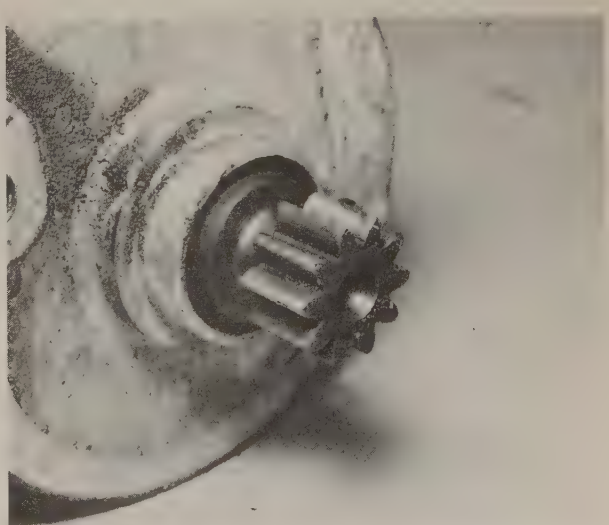


7.3b Pull out pin to disengage plunger from fork

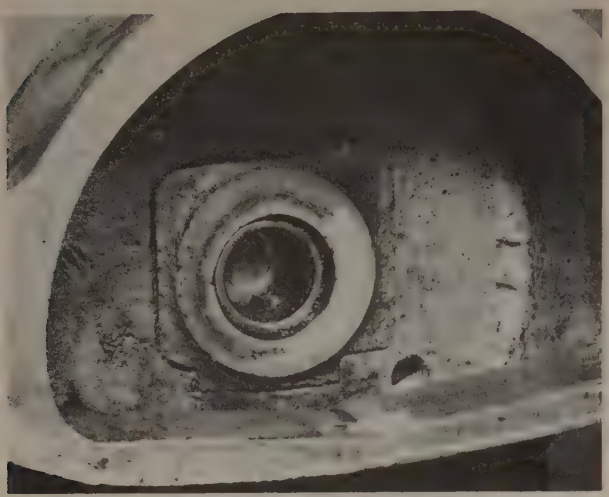


7.3c Unscrew fork pivot screw from the casing

7.5a Check condition of starter driven teeth and ...



7.5b ... teeth of starter drive gear



7.5c This bearing is prone to lack of lubrication

7.5d Check that the 'O' ring is in good condition

8.1 Headlamp rim is held by one screw

## 9 Stop and tail lamp: replacing the bulbs

1 The tail lamp has a twin filament bulb of 4/32 cp rating, to illuminate the rear number plate and to indicate when the rear brake is applied. The stop lamp also operates in conjunction with the front brake; a stop lamp switch is incorporated in the front brake assembly to meet the statutory requirements of the country or state to which the machine is exported.
2 To gain access to the stop and tail lamp bulb, unscrew the two crosshead screws which retain the plastic lens cover in position. The bulb has a bayonet fitting and also offset pins so that the stop lamp filament cannot be inadvertently connected with the tail lamp and vice versa.

## 10 Flashing indicator lamps: replacing bulbs

1 Flashing indicator lamps are fitted to the front and rear. They are mounted at the front by bolting them to a vertical plate either side of the fork legs or by clamping them direct to the handlebars. The other set are attached to the rear mudguard, immediately beneath the end of the dual seat.

2 Each flasher unit has a bayonet fitting 32 cp bulb. To replace a bulb remove the plastic end cover which is retained by two crosshead screws.

## 11 Flashing indicator relay: location and replacement

1 The flashing indicator relay fitted in conjunction with the flashing indicator lamps is located close to the other electrical components, either under the fuel tank or the headlamp cowl to isolate it from the harmful effects of vibration.
2 When the relay malfunctions it must be renewed; a repair is impracticable. When the unit is in working order, audible clicks will be heard which keep pace with the flash of the indicator lamps. If the lamps malfunction, check firstly that a bulb failure is not responsible, or the handlebar switch faulty. The usual symptom of a fault is one initial flash before the unit goes dead.
3 Take great care when handling a flashing indicator relay. It is easily damaged, if dropped.

## 12 Speedometer and tachometer heads: replacing the bulbs

1 The speedometer head and the tachometer head (where fitted) on FX models each have a single bulb of 2 cp rating, to illuminate the dial during the hours of darkness. Access to the bulb in each case is gained by removing the baseplate of the instrument head, which is secured by two nuts and washers.
2 On Electra Glide models the 2 cp rated bulb is similarly fitted. To gain access to the bulb and holder the lighting console cover must be removed. It is retained by a single, central screw.

## 13 Horn: adjustment

1 The horn is provided with an adjusting screw in the back of the horn body so that the sound volume can be varied, if necessary. To adjust the horn note, turn the screw not more than one half turn in either direction and test. If the note is weaker, or lost altogether, turn in the opposite direction. Continue adjusting by one half turn at a time until the desired volume and note is obtained.
2 If the horn malfunctions completely and cannot be restored by adjustment, it will have to be renewed as a complete unit. A repair is not practicable, as the complete assembly is riveted together. If the horn is not in full working order, this is generally regarded as an offence and prosecution may follow.

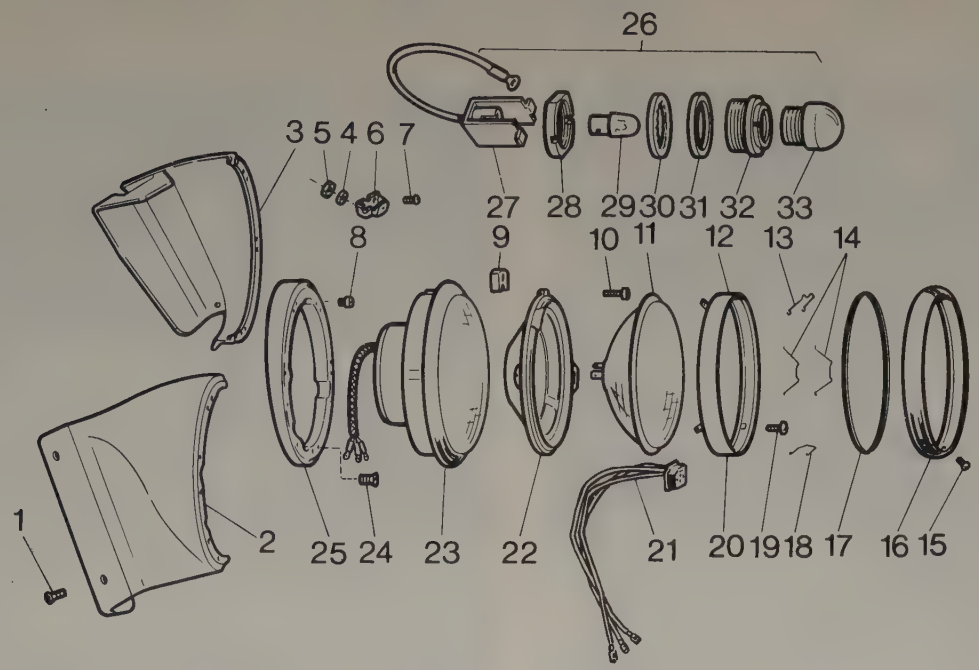



**Fig. 8.5. Headlamp - FL and FLH models**

1 *Screw - 4 off*
2 *RH shell half*
3 *LH shell half*
4 *Fibre washer - 2 off*
5 *Nut - 2 off*
6 *Retaining catch*
7 *Screw - 2 off*
8 *Rubber buffer - 3 off*
9 *Threaded block - 2 off*
10 *Adjuster screw - 2 off*
11 *Sealed beam unit*
12 *Inner rim*
13 *Catch spring*
14 *Side retaining spring - 2 off*
15 *Screw*
16 *Headlamp rim*
17 *Rubber ring*
18 *Lower spring*
19 *Adjuster screw*
20 *Inner rim - 1971 on*
21 *Wiring socket*
22 *Mounting ring*
23 *Headlamp unit*
24 *Screw - 6 off*
25 *Headlamp housing*
26 *High beam warning lamp - complete*
27 *Lamp body*
28 *Nut*
29 *Bulb*
30 *Serrated washer*
31 *Fibre washer*
32 *Lamp holder*
33 *Lens*

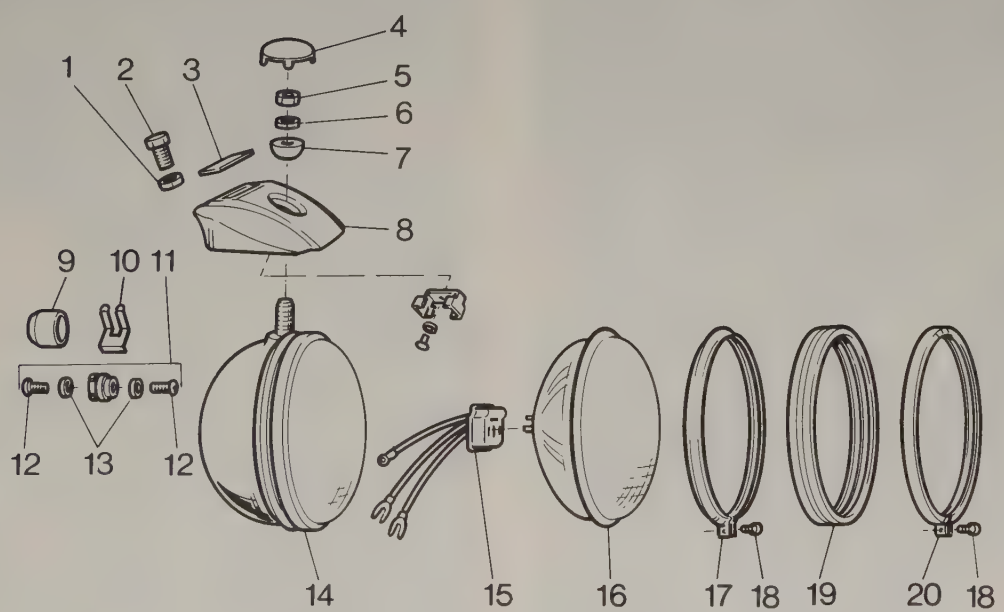
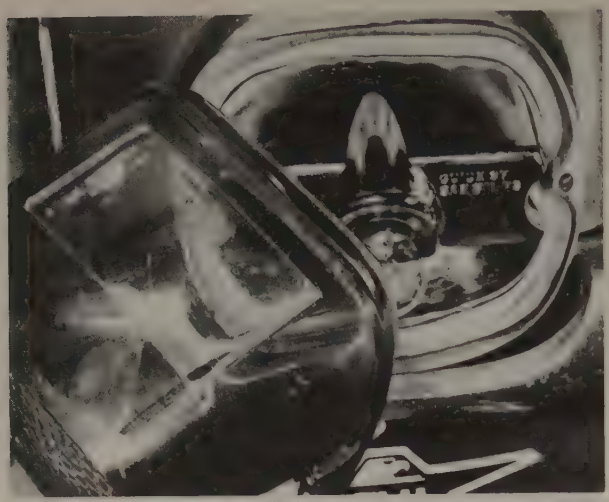
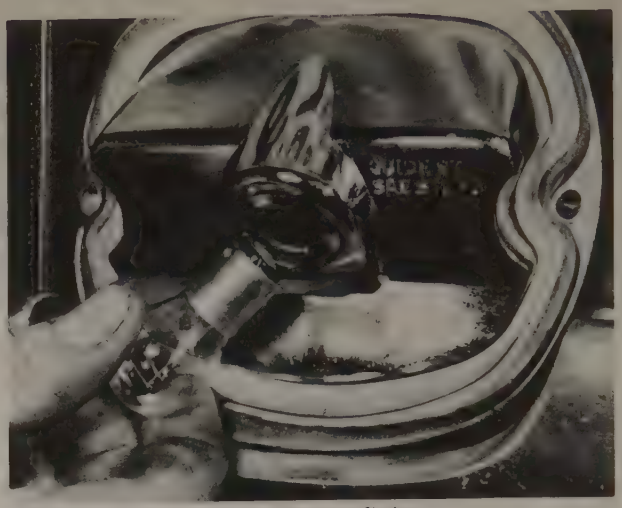



**Fig. 8.6. Headlamp - FX and FXE models**

1 *Spring washer - 2 off*
2 *Bolt - 2 off*
3 *Trim*
4 *Chrome cap*
5 *Nut*
6 *Spring washer*
7 *Domed washer*
8 *Headlamp bracket*
9 *Terminal cap - 2 off (1973 - 74)*
10 *Retainer spring - 4 off*
11 *Terminal unit - 2 off*
12 *Screw - 4 off*
13 *Serrated washer - 4 off*
14 *Headlamp - complete*
15 *Wiring socket*
16 *Sealed beam unit*
17 *Inner clamp*
18 *Screw - 2 off*
19 *Mounting ring*
20 *Outer clamp/rim*



9.2a Tail/stoplamp lens is held by two screws



9.2b Twin filament bulb has bayonet fitting

10.1a Indicator lens is held by two screws

10.1b Indicator bulb has bayonet fitting - note corroding bulb cap

## 14 Handlebar switches: general

1 Generally speaking, the handlebar switches give little trouble, but if necessary, they can be dismantled by separating the halves which form a split clamp around the handlebars.
2 Always disconnect the battery before removing any of the switches, to prevent the possibility of a short circuit. Most troubles are caused by dirty contacts, which can often be cleaned in situ by means of an aerosol type cleanser specially formulated for this purpose. Repairs are usually quite impracticable and in the event of breakage or pronounced wear of some internal part it will be necessary to renew the complete switch unit.

## 15 Ignition and lighting switch: general

1 On all Super Glide models the main switch which controls both the ignition system and the lighting is attached to a bracket on the left-hand side of the machine, immediately above the horn. The plate to which the switch and near-by choke are attached, is retained to the cross-bracket of the cylinder heads stay by a single nut. The switch is retained to the plate by a threaded ring around its exterior, which will release the switch, once it is removed.
2 If the switch malfunctions, it will have to be renewed; a repair is not possible. Note that if the switch is changed, the key will have to be changed too.
3 The switch does not normally require attention and it should not be oiled, otherwise there is risk of oil reaching the electrical contacts within and acting as an insulator.
4 The ignition and lighting switch on Electra Glide models is fitted to the control console on the petrol tank. The four position switch does not require a key for normal operation but may be locked in the OFF or PARK position, using the lock hidden below the flip-top cover.
5 If the switch malfunctions, it may be dismantled for cleaning or contact replacement. Disconnect the battery and remove the console cover. Detach all the wires leading to the switch, each being held by a screw. Remove the switch from the mounting plate by unscrewing the four cross-head screws.
6 When dismantling the switch, it should be inverted in the OFF position and unlocked. Grasp the roller contact with a pair of stout pliers and pull it from position, away from the contact rollers. Lift out the roller and the contact mounting plate. Note

that the plate is fitted with the three terminal portion facing away from the lock cover hinge. The final components can be eased from position by freeing the tabs on the switch mounting plate, first from one side and then from the other side of the chrome cover.

7 Check all components for wear, renewing those which are in poor condition. Clean the contacts and contact roller with very fine emery cloth. When reassembling, apply grease to all working parts excepting the contact points.

## 16 Spotlamps: replacing the bulbs

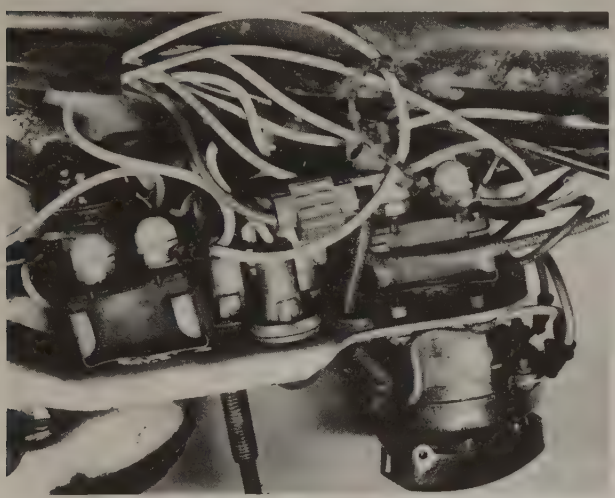
*Electra Glide models only*

1 The Electra Glide model is fitted with two spotlamps mounted either side of the headlamp and supported by a common mounting bar. As with the headlamp, the bulb is incorporated in a sealed beam unit which must be renewed as a whole if a filament fails. The sealed beam unit is retained by the clamp type rim, which is secured by a screw at the base of the rim.

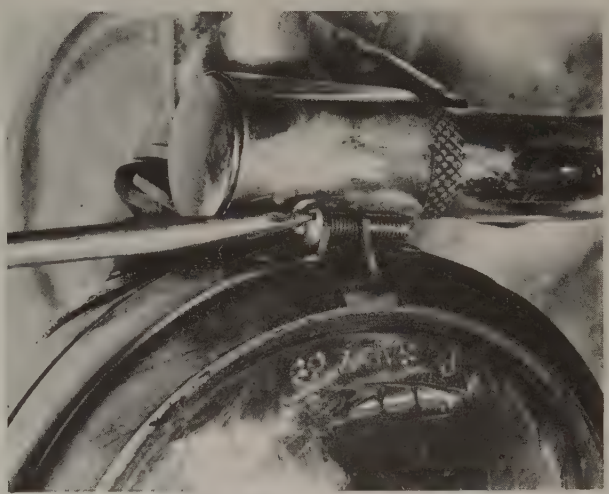
## 17 Stoplamp switches

1 The rear brake stoplamp switch is incorporated in the hydraulic line and is mounted to the rear of the oil pump. No adjustment is required or possible and if the switch fails it must be renewed as repair is impracticable.

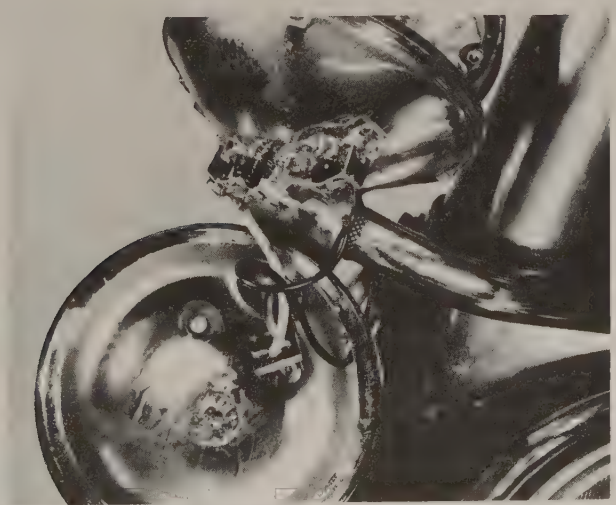
2 A stoplamp switch is also incorporated in the front brake system. The switch is of the mechanical type, being held in the OFF position when the handlebar lever is at rest. In common with the rear brake switch, repair and adjustment are not provided for.



15.4 Ignition switch is retained by four screws



16.1a Spotlamp glass/reflector unit is retained by clamp

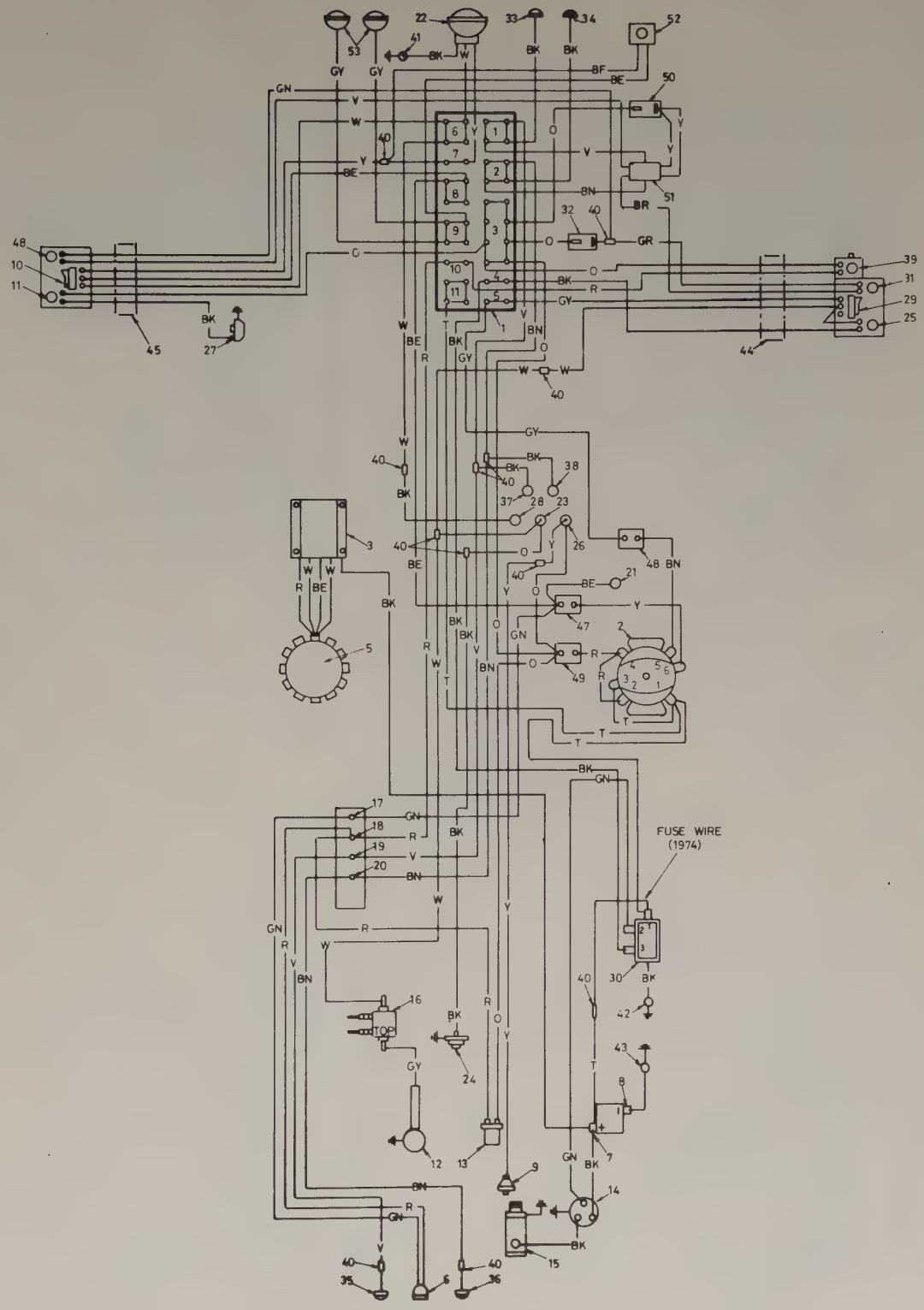


16.1b Spotlamps have sealed beam bulbs

17.1 Rear brake switch mounted forward of gearbox

**18 Fault diagnosis: electrical system**

| Symptom | Cause | Remedy |
|---|---|---|
| Complete electrical failure | Isolated battery | Check battery connections for signs of corrosion. |
| Constant blowing of bulbs | Vibration or poor earth connections | Check bulb holders, check earth return connections. |
| Dim lights, horn and starter do not work | Discharged battery | Recharge battery with a battery charger. Check alternator and rectifier-regulator performance. |
| Starter motor sluggish or will not work | Worn brushes | Remove cover and replace worn brushes. Clean commutator. |
| Flashing lights will not flash | Faulty relay unit<br>Bad earth | Replace with a new relay unit.<br>Check flasher lamp bulb holders for good earth. |



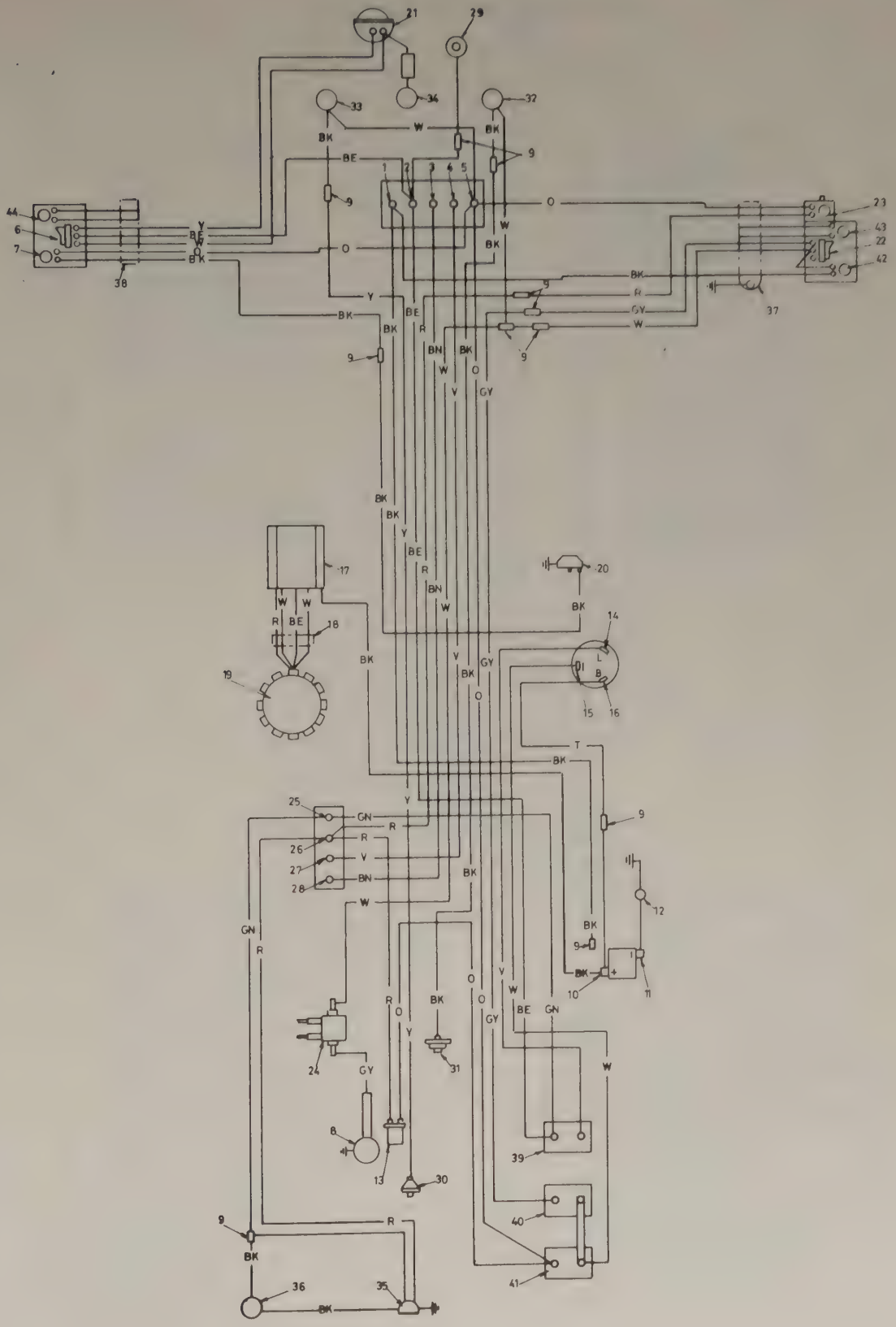

Wiring diagram 1973 - 74 FL/FLH 1200 models

Fig. 8.7. 1973 - 74 FL/FLH 1200 models

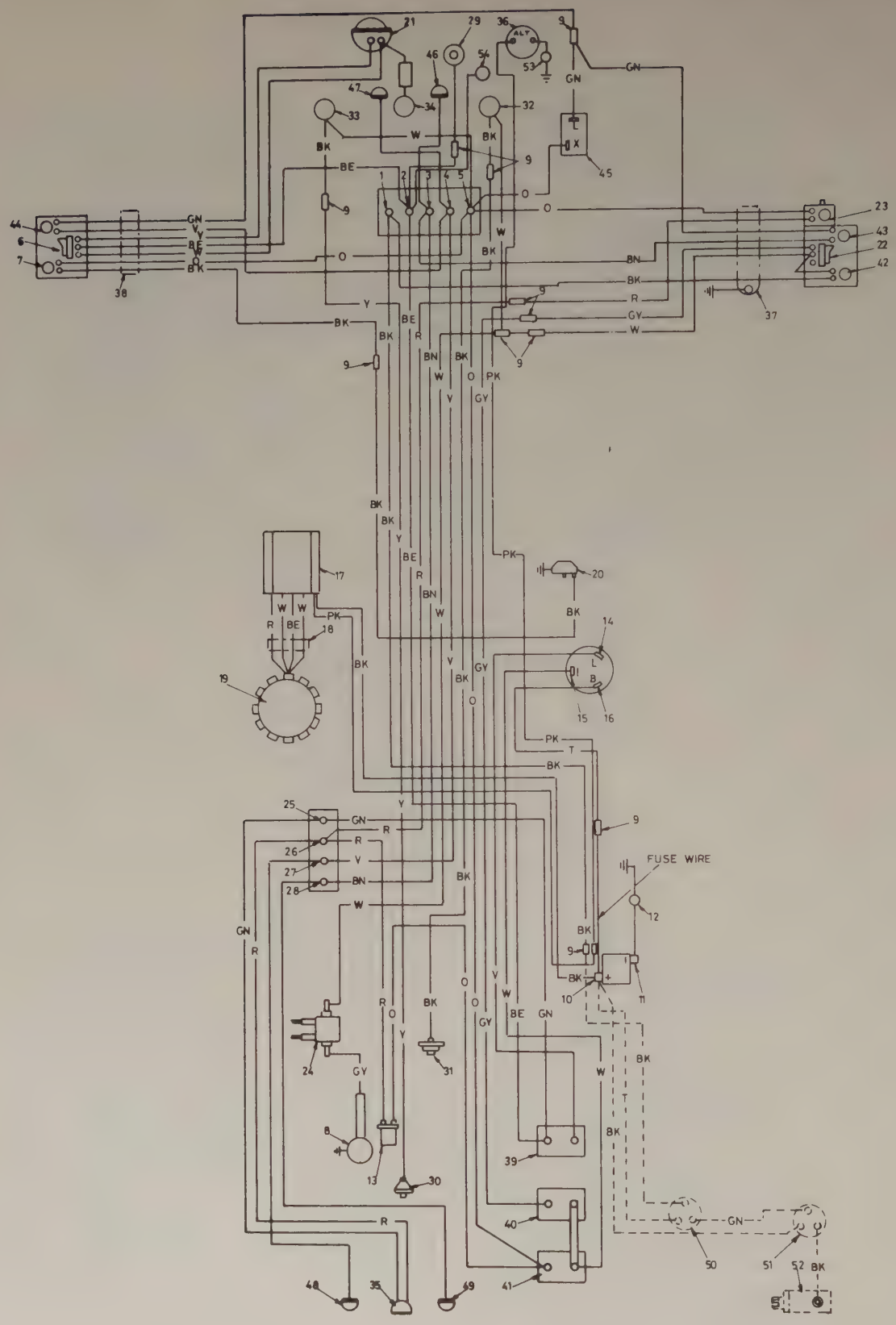
1 Front terminal board terminals (1 to 11)
2 Switch terminals (1 to 6)
3 Regulator-rectifier module
4 Alternator to module connector plug
5 Alternator stator
6 Tail and stop lamp
7 Battery positive terminal
8 Battery negative terminal
9 Oil pressure signal switch
10 Headlamp beam switch
11 Horn switch
12 Contact breaker
13 Stop lamp switch - rear
14 Starter solenoid
15 Starter motor
16 Ignition coil
17 Rear terminal board terminal - top
18 Rear terminal board terminal
19 Rear terminal board terminal
20 Rear terminal board terminal - bottom
21 Speedometer light
22 Headlamp
23 Neutral indicator light
24 Neutral switch
25 Starter button
26 Oil signal light
27 Horn
28 High beam indicator lamp
29 Engine stop switch
30 Starter relay
31 Right direction signal switch
32 Direction signal flasher
33 Left front direction lamp
34 Right front direction lamp
35 Left rear direction lamp
36 Right rear direction lamp
37 Left direction signal pilot lamp
38 Right direction signal pilot lamp
39 Stop lamp switch - front
40 Connector
41 Terminal board mounting screw
42 Transmission stud
43 Frame lug bolt
44 Right handlebar
45 Left handlebar
46 Left direction signal switch
47 Lighting circuit breaker
48 Ignition circuit breaker
49 Accessories circuit breaker
50 Emergency flasher
51 Emergency flasher switch
52 Passing lamp switch
53 Passing lamp

Fig. 8.8. 1973 FX 1200 model

1 to 5 Fork terminal board terminals
6 Headlamp beam switch
7 Horn switch
8 Contact breaker
9 Wire connector
10 Battery positive terminal
11 Battery negative terminal
12 Frame lug bolt
13 Stop lamp switch - rear
14 Switch 'L' lights terminal
15 Switch 'I' ignition terminal
16 Switch 'B' battery terminal
17 Regulator-rectifier module
18 Alternator to module connector plug
19 Alternator stator
20 Horn
21 Headlamp
22 Engine stop switch
23 Stop lamp switch - front
24 Ignition coil
25 Rear terminal board terminal - top
26 Rear terminal board terminal
27 Rear terminal board terminal
28 Rear terminal board terminal - bottom
29 Speedometer light
30 Oil pressure signal switch
31 Neutral switch
32 Neutral indicator light
33 Oil signal lamp
34 High beam indicator lamp
35 Tail and stop lamp
36 License lamp
37 Right handlebar
38 Left handlebar
39 Lighting circuit breaker
40 Ignition circuit breaker
41 Accessories circuit breaker
42 Switch




Wiring diagram 1973 FX 1200 model



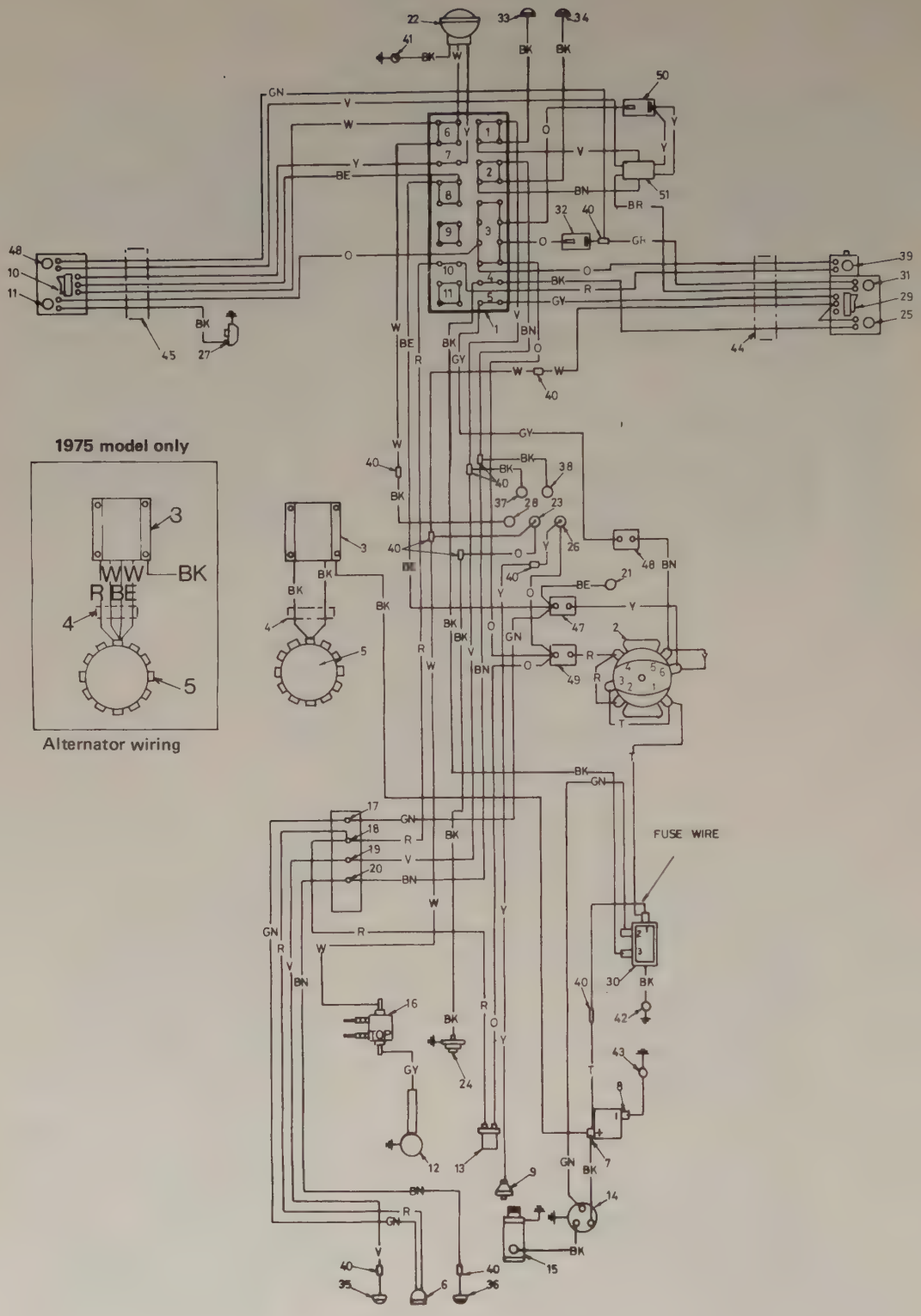

Wiring diagram 1974 FX/FXE 1200 models

**Fig. 8.9. 1974 FX/FXE 1200 models**

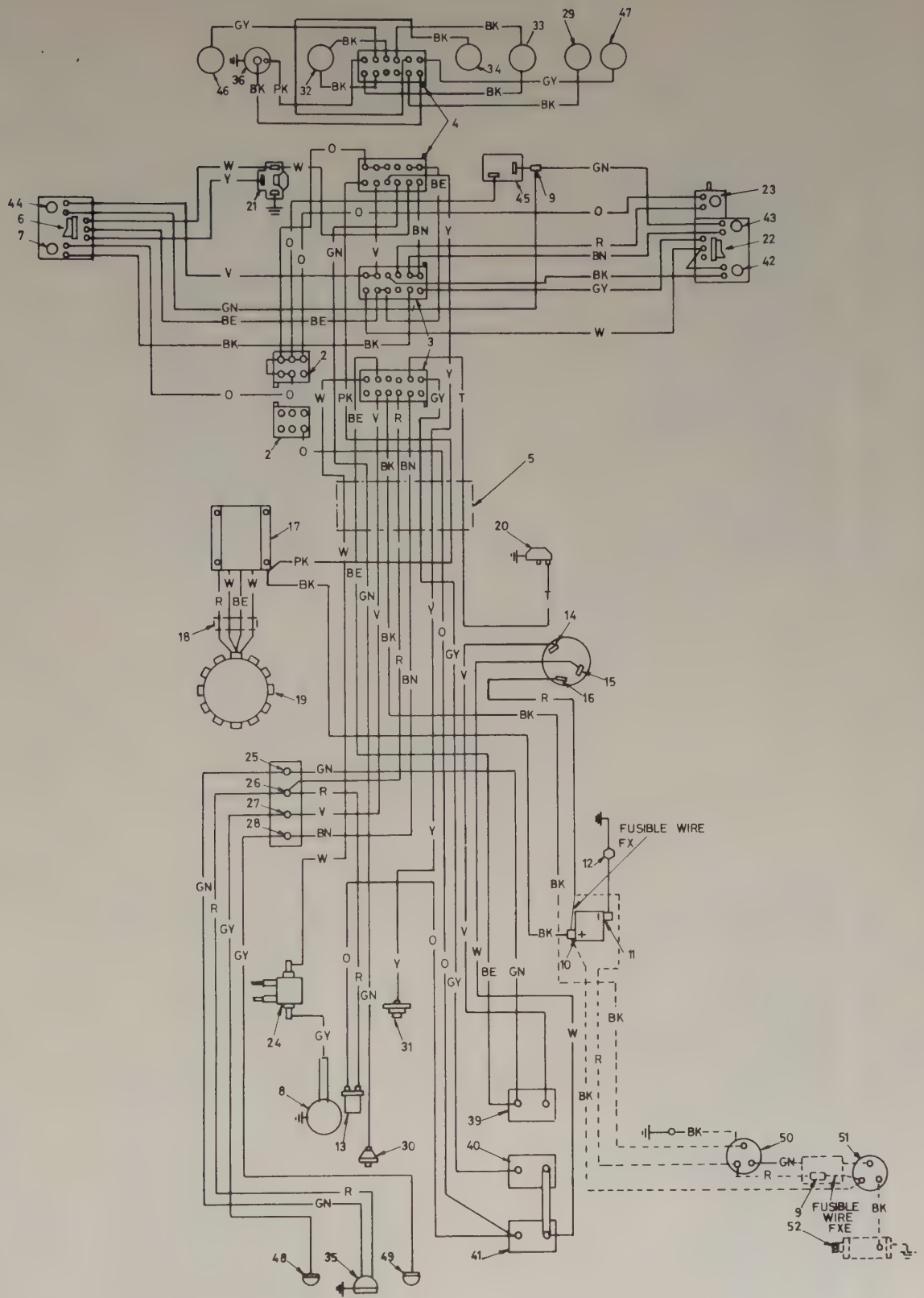
1 to 5 Fork terminal board terminals
6 Headlamp beam switch
7 Horn switch
8 Contact breaker
9 Wire connector
10 Battery positive terminal
11 Battery negative terminal
12 Frame lug bolt
13 Stop lamp switch - rear
14 Switch 'L' lights terminal
15 Switch 'I' ignition terminal
16 Switch 'B' battery terminal
17 Regulator-rectifier module
18 Alternator to module connector plug
19 Alternator stator
20 Horn
21 Headlamp
22 Engine stop switch
23 Stop lamp switch - front
24 Ignition coil
25 Rear terminal board terminal - top
26 Rear terminal board terminal
27 Rear terminal board terminal
28 Rear terminal board terminal - bottom
29 Speedometer light
30 Oil pressure signal switch
31 Neutral switch
32 Neutral indicator light
33 Oil signal lamp
34 High beam indicator lamp
35 Tail and stop lamp
36 Tachometer
37 Right handlebar
38 Left handlebar
39 Lighting circuit breaker
40 Ignition circuit breaker
41 Accessories circuit breaker
42 Switch
43 Right direction signal switch
44 Left direction signal switch
45 Direction signal flasher
46 Left front direction lamp
47 Right front direction lamp
48 Left rear direction lamp
49 Right rear direction lamp
50 Starter relay (FXE only)
51 Starter solenoid (FXE only)
52 Starter motor (FXE only)
53 Handlebar pinch bolt
54 Tachometer light

**Fig. 8.10. 1975 and 1976 FL/FLH 1200 models**

1 Front terminal board (terminals 1 to 11)
2 Switch (terminals 1 to 6)
3 Regulator-rectifier module
4 Alternator to module connector plug
5 Alternator stator
6 Tail and stop lamp
7 Battery positive terminal
8 Battery negative terminal
9 Oil pressure signal switch
10 Headlamp beam switch
11 Horn switch
12 Ignition breaker (timer)
13 Stop lamp switch - rear
14 Starter solenoid
15 Starter motor
16 Ignition coil
17 Rear terminal board terminal - top
18 Rear terminal board terminal
19 Rear terminal board terminal
20 Rear terminal board terminal - bottom
21 Speedometer light
22 Headlamp
23 Neutral indicator light
24 Neutral switch
25 Starter button
26 Oil signal light
27 Horn
28 High beam indicator lamp
29 Engine stop switch
30 Starter relay
31 Right direction signal switch
32 Direction signal flasher
33 Left front direction lamp
34 Right front direction lamp
35 Left rear direction lamp
36 Right rear direction lamp
37 Left direction signal pilot lamp
38 Right direction signal pilot lamp
39 Stop lamp switch - front
40 Connector
41 Terminal board mounting screw
42 Transmission stud
43 Frame lug bolt
44 Right handlebar
45 Left handlebar
46 Left direction signal switch
47 Lighting circuit breaker
48 Ignition circuit breaker
49 Accessories circuit breaker
50 Emergency flasher
51 Emergency flasher switch




Wiring diagram 1975 and 1976 FL/FLH 1200 models



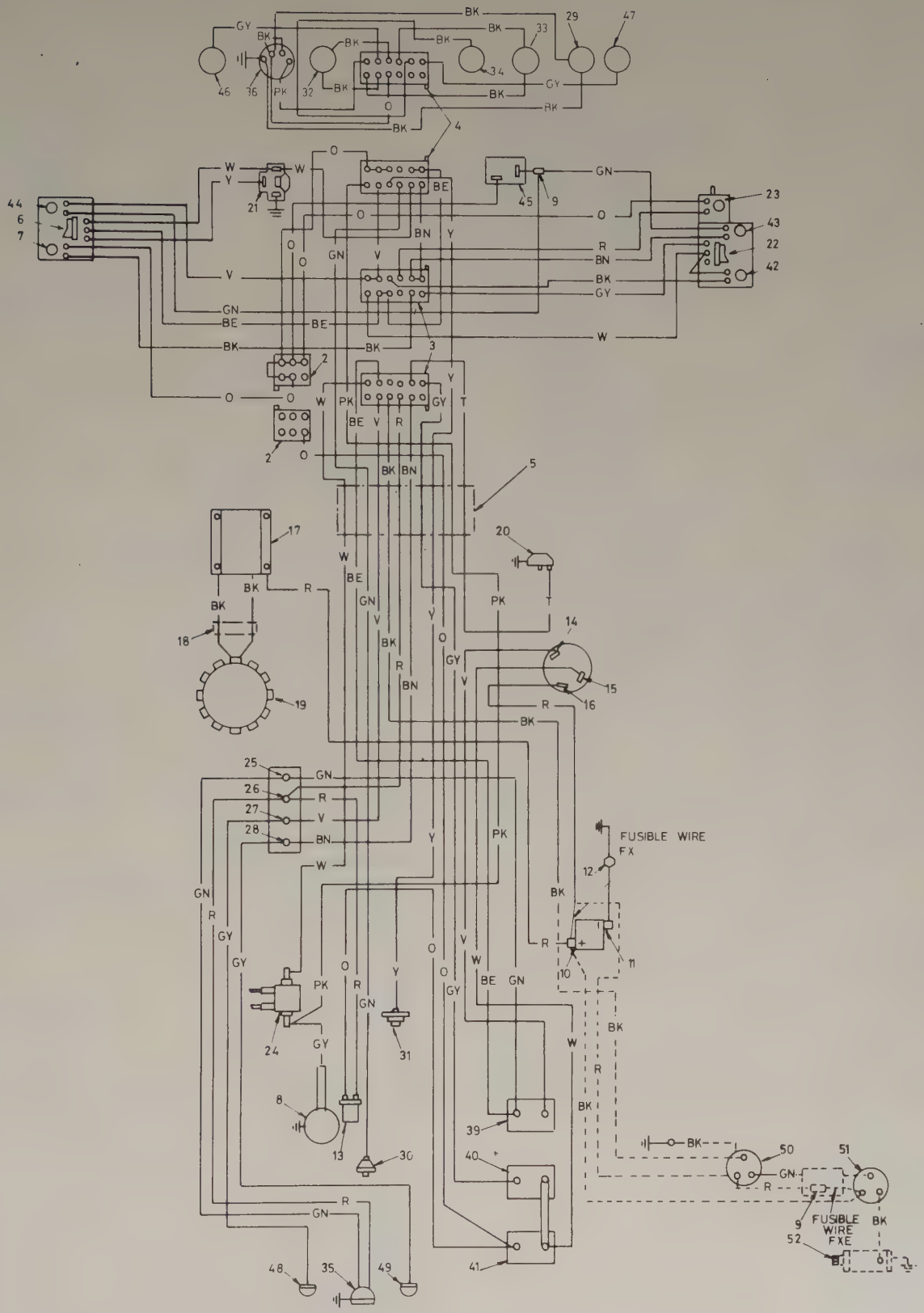

Wiring diagram 1975 FX/FXE 1200 models

Fig. 8.11. 1975 FX/FXE 1200 models

1 Headlamp housing
2 Socket - plug combination
3 Socket - plug combination
4 Socket - plug combination
5 Wiring harness
6 Headlamp beam switch
7 Horn switch
8 Contact breaker
9 Wire connector
10 Battery positive terminal
11 Battery negative terminal
12 Frame lug bolt
13 Stop lamp switch - rear
14 Switch 'L' lights terminal
15 Switch 'I' ignition terminal
16 Switch 'B' battery terminal
17 Regulator-rectifier module
18 Alternator to module connector plug
19 Alternator stator
20 Horn
21 Headlamp socket
22 Engine stop switch
23 Stop lamp switch - front
24 Ignition coil
25 Rear terminal board terminal - top
26 Rear terminal board terminal
27 Rear terminal board terminal
28 Rear terminal board terminal - bottom
29 Speedometer light
30 Oil pressure signal switch
31 Neutral switch
32 Neutral indicator light
33 Oil signal lamp
34 High beam indicator lamp
35 Tail and stop lamp
36 Tachometer
39 Lighting circuit breaker
40 Ignition circuit breaker
41 Accessories circuit breaker
42 Starter switch
43 Right direction signal switch
44 Left direction signal switch
45 Direction signal flasher
46 Left front direction lamp
47 Right front direction lamp
48 Left rear direction lamp
49 Right rear direction lamp
50 Starter relay (FXE only)
51 Starter solenoid (FXE only)
52 Starter motor (FXE only)

Fig. 8.12. 1976 FX/FXE 1200 models

1 Headlamp housing
2 Socket - plug combination
3 Socket - plug combination
4 Socket - plug combination
5 Wiring harness
6 Headlamp beam switch
7 Horn switch
8 Contact breaker
9 Wire connector
10 Battery positive terminal
11 Battery negative terminal
12 Frame lug bolt
13 Stop lamp switch - rear
14 Switch 'ST' lights terminal
15 Switch 'G' ignition terminal
16 Switch 'B' battery terminal
17 Regulator-rectifier module
18 Alternator to module connector plug
19 Alternator stator
20 Horn
21 Headlamp socket
22 Engine stop switch
23 Stop lamp switch - front
24 Ignition coil
25 Rear terminal board terminal - top
26 Rear terminal board terminal
27 Rear terminal board terminal
28 Rear terminal board terminal - bottom
29 Speedometer light
30 Oil pressure signal switch
31 Neutral switch
32 Neutral indicator light
33 Oil signal lamp
34 High beam indicator lamp
35 Tail and stop lamp
36 Tachometer
39 Lighting circuit breaker
40 Ignition circuit breaker
41 Accessories circuit breaker
42 Starter switch
43 Right direction signal switch
44 Left direction signal switch
45 Direction signal flasher
46 Left front direction lamp
47 Right front direction lamp
48 Left rear direction lamp
49 Right rear direction lamp
50 Starter relay (FXE only)
51 Starter solenoid (FXE only)
52 Starter motor (FXE only)




Wiring diagram 1976 FX/FXE 1200 models

# Index


A

Alternator - 17, 130
Air cleaner - 86
Automatic advance unit - 96

B

Balancing - wheel - 128
Barrel - cylinder - 38
Battery - 131
Bleeding the hydraulic brake system - 123
Bearings:
  Big-end and main - 36
  Front wheel - 118
  Rear wheel - 121
  Small end - 37
  Steering head - 108
Brakes:
  Examination and renovation:
    Front - 117
    Rear - 121
  Rear brake pedal - 112
Buddy seat - 113
Bulbs - renewal - 134 - 136

C

Cables:
  Choke - 86
  Clutch - 58
  Speedometer - 114
  Tachometer - 114
  Throttle - 81
Capacities - 15, 80
Carburettor:
  Adjustment - 85
  Removal - 81
  Setting - 85
Chain oiler - 126
Cleaning the machine - 114
Clutch:
  Adjustment - 77
  Examination and renovation - 75
Coil - ignition - 94
Contact breaker:
  Adjustment - 94
  Removal - 95
  Replacement - 95
Crankcase - 42
Cylinder barrels - 38
Cylinder heads - 38

D

Decarbonising - 38
Diagrams:
  Carburettor float level - 85
  Checking alternator output - 131
  Wiring - 141 - 149
Dual seat - 112

E

Electrical system:
  Alternator - 130
  Battery - 131
  Bulb replacement - 134 - 136
  Headlamp - 134
  Starter motor - 131
  Starter motor solenoid - 133
  Switches:
    Handlebar - 138
    Ignition and lighting - 138
    Stoplamp - 139
Engine:
  Automatic advance unit - 47
  Big-end and main bearings - 36
  Cylinder barrels and head - 38
  Dismantling - general - 25 - 28
  Examination and renovation - general - 35
  Gudgeon pin - 37
  Hydraulic tappets - 41
  Lubrication - 87
  Oil change - 10
  Oil pump - 33 - 34
  Reassembly - general - 42
  Rebuilt engine:
    Running and starting - 55
  Refitting in frame - 49
  Removal from frame - 18
  Tolerances and wear limits - 16
Exhaust system - 87

F

Fault diagnosis:
  Brakes - 128
  Carburettors - 91
  Clutch - 79
  Electrical system - 140
  Engine - 56
  Frame and forks - 115
  Fuel system - 91
  Gearbox - 73
  Ignition system - 98
  Lubrication system - 91
  Tyres - 128
  Wheels - 128

Filters:
Air - 86
Oil - 90
Petrol tap - 81
Footboards and footrests - 112
Frames and forks:
Frame assembly - 108
Front forks - 99, 101 - 103 - 106
Prop stand - 112
Steering head bearings - 108
Swinging arm rear fork - 108

G

Gearbox:
Dismantling - 58
Examination - 65 - 66
Reassembly - 65 - 70
Gudgeon pin - 37

H

Handlebar switches - 138
Headlamp - 134
Horn - 176
Hydraulic tappets - 136

I

Ignition:
Coil - 94
Ignition and lighting switch - 138
Timing - 95

K

Kickstart - 67

L

Lubricant capacities - 15, 80
Lubrication - engine - 87

M

Maintenance - routine - 8 - 14
Main bearings - 36
Master cylinders - front and rear - 122

O

Oil change - engine - 10
Oil filter - 90
Oil pressure - checking - 90
Oil pump - 89
Ordering spare parts - 7

P

Pedal - rear brake - 112
Petrol tank - 80
Petrol tap - 81
Pistons and rings - 38
Points - contact breaker - 95
Primary chain and sprockets - 78
Prop stand - 112

Q

Quick glance maintenance - 15

R

Rear brake pedal - 112
Rear suspension unit - 112
Recommended lubricants - 15
Rectifier-regulator module - 131
Rings and pistons - 38
Rocker boxes - 39, 99
Routine maintenance - 8 - 14
Running-in rebuilt engine - 55

S

Seat - dual - 112
Silencer - exhaust - 87
Spark plugs - 96
Specifications:
Brakes - 116
Clutch - 74
Electrical system - 130
Engine - 16 - 17
Frame and forks - 99
Fuel system - 80
Gearbox - 57 - 58
Ignition system - 93
Lubrication - 80
Tyres and wheels - 116
Speedometer head - 113
Sprocket - rear wheel - 123
Starter motor - 131
Starter motor driveshaft - 134
Starting rebuilt engine - 55
Statutory requirements - 8, 128, 134, 136
Steering head bearings - 108
Swinging arm - 108
Switches - 138

T

Tank - petrol - 80
Tappets - hydraulic - 41
Technical specifications: refer to Specifications
Timing - ignition - 95
Torque wrench settings - engine - 17
Tyres - removal and replacement - 128
Tyre valve caps - 128

V

Valve grinding - 38
Valve seats and guides - 38

W

Wheel balancing - 128
Wheel bearings - 118, 121
Wheels - front - 116
Wheels - rear - 121
Wiring diagrams - 141 - 149

Printed by
Haynes Publishing Group
Sparkford Yeovil Somerset
England

B460 23968 6

APPROVED AND RECOMMENDED

Haynes Owners Workshop Manuals for Motorcycles are written with the home mechanic in mind who does not have the luxury of a well equipped workshop nor factory service tools. Each manual covers a well defined model range of motorcycles. A second hand example is purchased and is used as the basis for the manual. Before overhaul begins the author undertakes considerable research into the model range and modification history talking with manufacturers, dealers, repair specialists and riders.
Each manual presents the dismantling, overhaul and reassembly in a logical sequence describing the component parts in the minutest detail. The outcome is best described by the following comments of the press:

# What the press say...

". . . . . .with help from these manuals published by Haynes you can, by following step-by-step instructions, perform just about every maintenance task you'll ever need to keep your bike running for years. We heartily recommend them"

*Cycle World (USA)*

". . . . . .a well illustrated manual written in everyday language. . . . . ."

*Motor Cycle News (UK)*

"Information is given clearly without assuming you've had a ten year course in engineering. . . . . ."

*Bike (UK)*

". . . . . .Haynes manuals assume that the owner will not have factory tools, and alternatives are either shown or discussed. . . . . ."

*Cycle (USA)*

"In each case the author has stripped down and rebuilt an example of each machine learning by practical experience. . . . . ."

*Motorcyclist Illustrated (UK)*

". . . . . .but also to offer very good value for money as well"

*Motorcycle Rider (UK)*

"The quality of the books is such that you can use the information contained inside to do anything from changing a main jet to replacing a broken gear in the transmission"

*Cycle World (USA)*

". . . . . .the text is not a veiled re-write of the factory manual. . . . . ."

*Cycle (USA)*

". . . . . .the home-working enthusiast will have no difficulty in mastering the art of any mechanical repairs if he just does it by numbers and looks at the pictures"

*South Africa Motor Cycle News*

"They show simple to follow step by step overhauls and are well illustrated"

*Motorcycle Mechanics (UK)*

1744/330

ISBN 0 85696 330 5

KQ-951-820